SURGICAL CONDITIONS OF THYROID

DR MOHAMED SOKA
SURGERY

Objectives

By the end of the session, student should be able to;

1. Describe surgical anatomy of the thyroid
2. Describe different thyroid diseases
3. Describe signs and symptoms of thyroid conditions
4. Diagnose and plan management of a patient presenting with a Thyroid condition/diseases.

CONTENTS

- Historical Perspective
- Development and Surgical Anatomy
- Physiology
- Common Thyroid. diseases
- Diagnostic work up
- Indications for Surgery
- Surgical options/ Indications
- Prognostic factors
- Post op Complication
- References

Historical Perspective

- *Thyroid* - Greek word ("thyreoides") - used to describe this gland- in the 16th and 17th centuries with unclear **function** of the gland.

- By the 19th century, **pathologic enlargement** of the thyroid, or goiter, was first described.

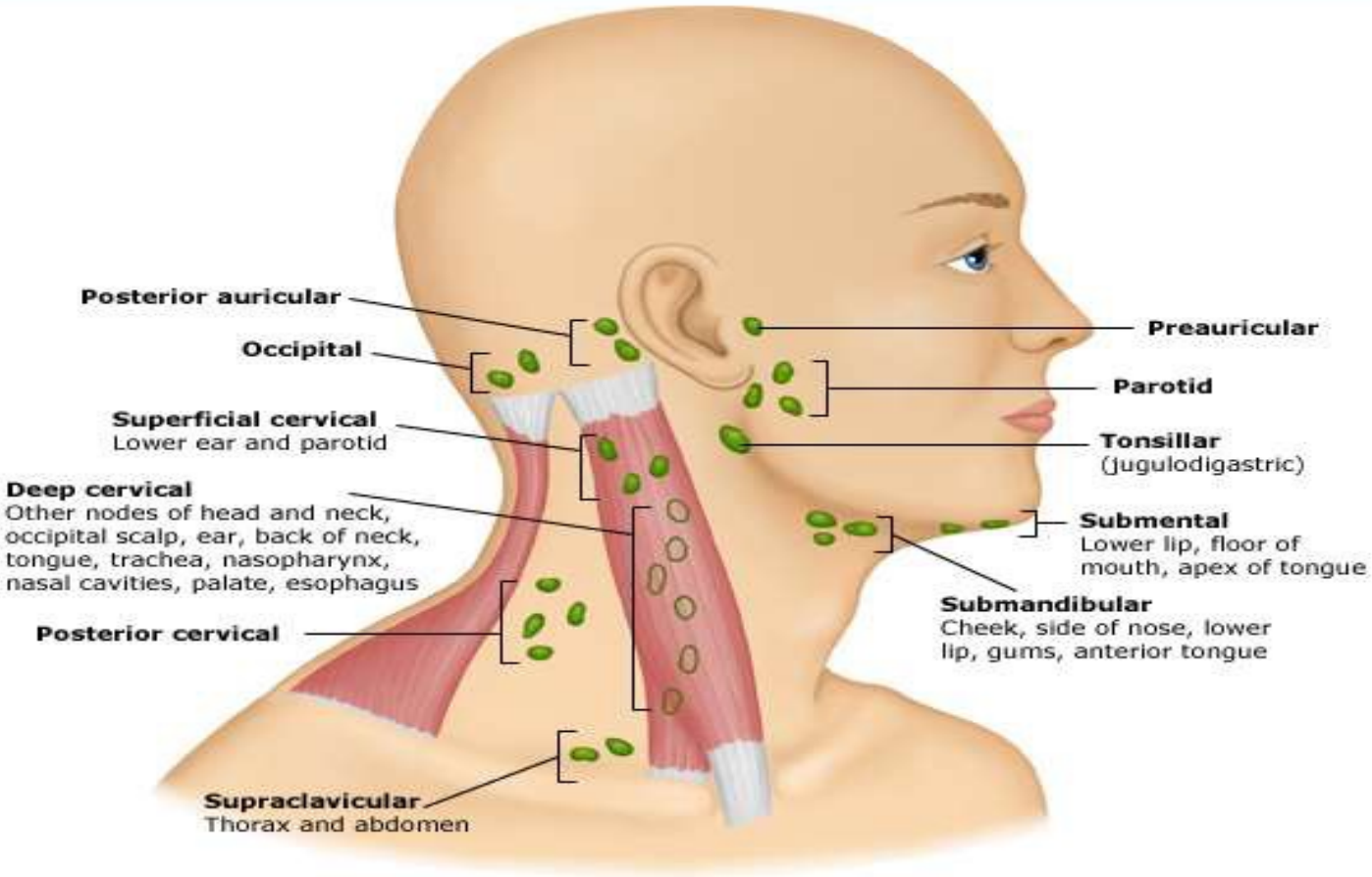
- In the late 19th century, the **treatment of thyroid diseases** became available through the discoveries made by **Theodor Billroth** and Emil **Theodor Kocher** (Nobel Prize -1909)

- There has been a rapid succession in the understanding of altered thyroid physiology (eg **hypo and hyper-thyroidism and even thyroid ca)**

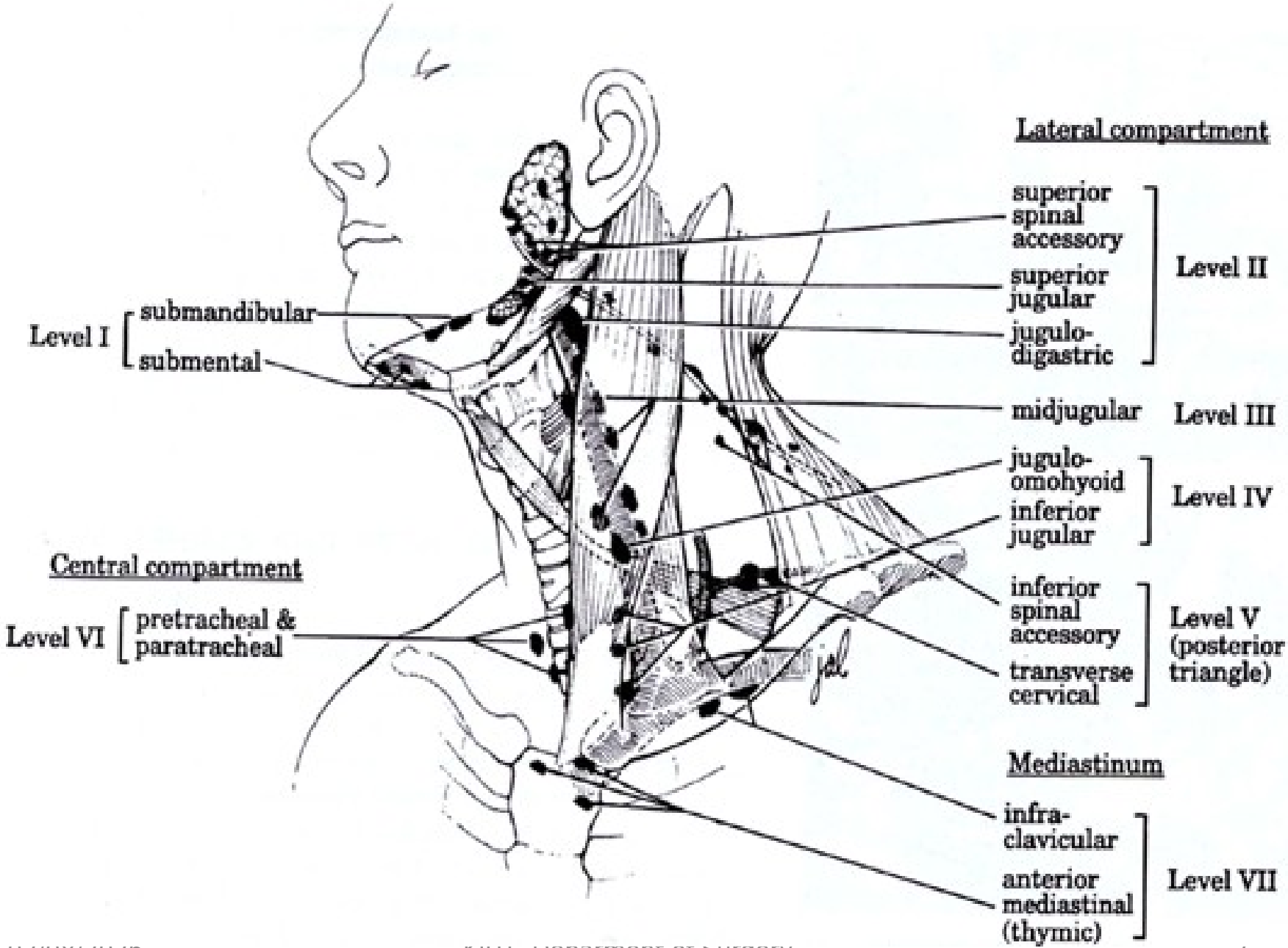
Embryology

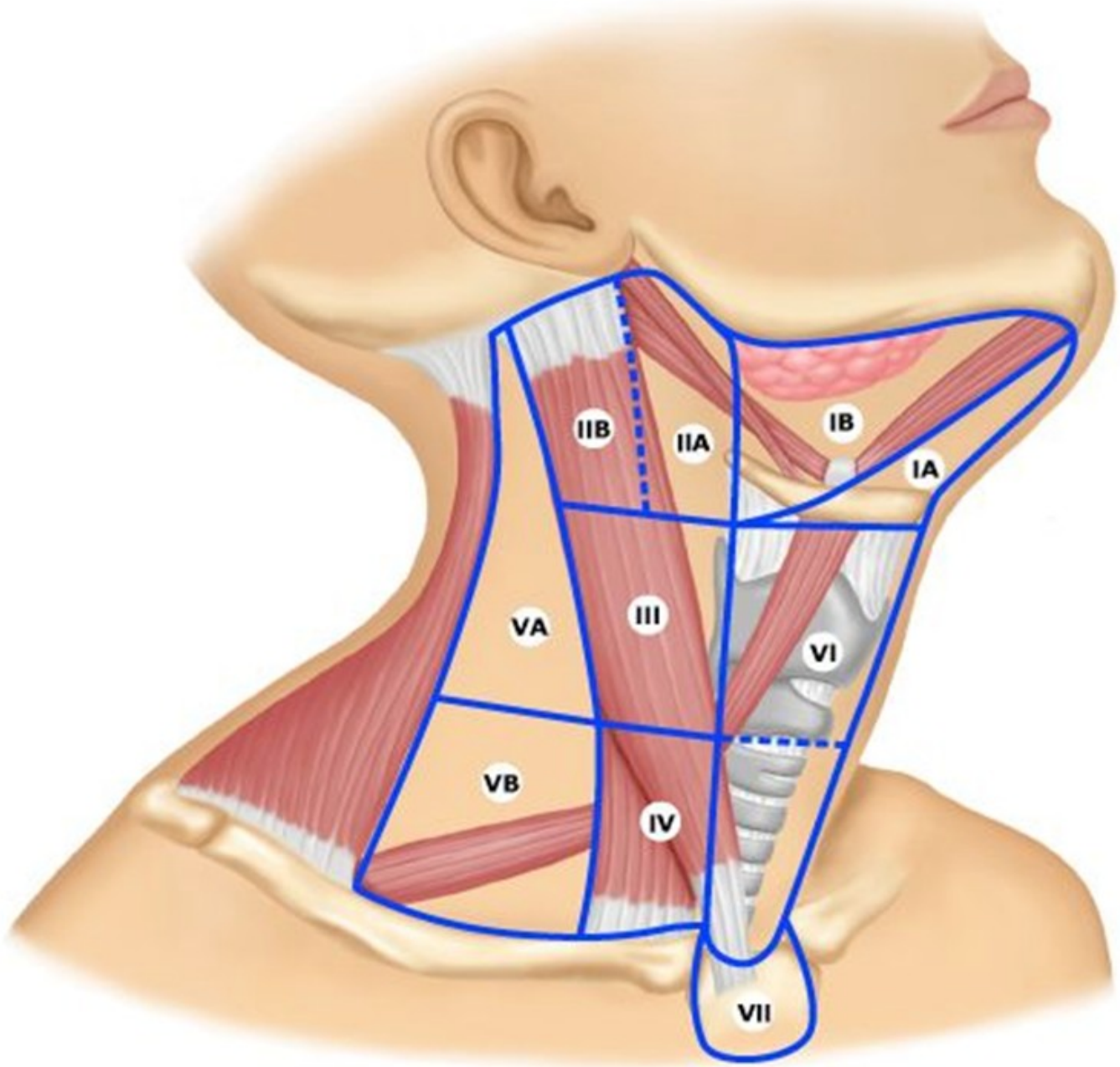
- It develops from midline diverticulum of a column of cells from the pharyngeal floor between 1st and 2nd pharyngeal pouches.
- The descent is anterior to structures that form hyoid bone and larynx .
- By 6 weeks of intrauterine life, the **central column,** which becomes the thyroglossal duct, gets reabsorbed.
- The duct bifurcates to form thyroid lobes.
- **Pyramidal lobe** is formed by a portion of the duct.
- **Calcitonin** producing **parafollicular or C cells** originate from the fourth branchial pouch.

Lymph nodes of the head and neck



This drawing schematically depicts the major lymph nodes in the head and neck area that are likely to be enlarged on physical examination in patients with various local or systemic diseases. The major nodal groups are shown here in bold, with the areas draining into these nodal groups noted when appropriate. While enlargement of both the left and right supraclavicular lymph nodes may reflect disease in the thorax, left supraclavicular nodal enlargement, because of its drainage pattern, may also reflect the presence of abdominal involvement (ie, Virchow's node).


Lateral compartment
superior spinal accessory
superior jugular
jugulo-digastric
Level II
Level I
submandibular
submental
midjugular
Level III
jugulo-omohyoid
inferior jugular
Level IV
Central compartment
Level VI
pretracheal & paratracheal
inferior spinal accessory
transverse cervical
Level V (posterior triangle)
Mediastinum
infra-clavicular
anterior mediastinal (thymic)
Level VII

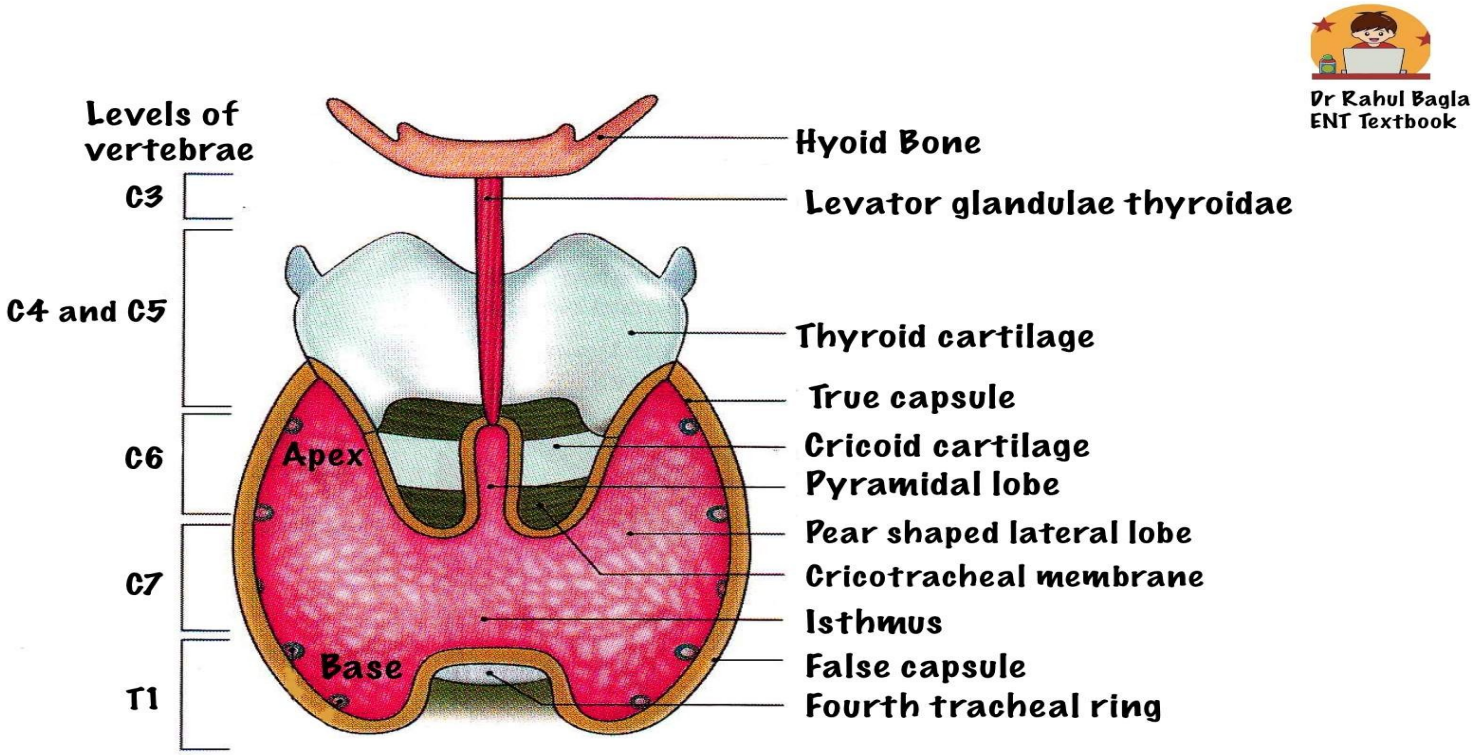

IIB
IIA
IB
IA
VA
III
VI
VB
IV
VII

Lymphatic drainage	Likely primary sites
Level I: Includes the submental and submandibular triangles	
Submental	Lower lip, chin, anterior oral cavity (including anterior one-third of the tongue and floor of the mouth)
Submandibular	Upper and lower lips, oral tongue, floor of the mouth, facial skin
Level II: Includes the superior jugular chain nodes extending from the mandible down to the carotid bifurcation and posterior border of the sternocleidomastoid muscle	Oral cavity and pharynx (including soft palate, base of the tongue, and piriform sinus)
Level III: Consists of the jugular nodes from the carotid bulb inferiorly to the omohyoid muscle	Larynx, hypopharynx, and thyroid
Level IV: Continues from the omohyoid muscle inferiorly to the clavicle	Larynx, hypopharynx, thyroid, cervical esophagus, and trachea
Level V: Represents the posterior border of the sternocleidomastoid anteriorly, the anterior border of the trapezius posteriorly, and the clavicle inferiorly	Nasopharynx, thyroid, paranasal sinuses, and posterior scalp
Supraclavicular	Infraclavicular sites (including lungs, esophagus, breasts, pancreas, gastrointestinal tract, gastrointestinal and genitourinary sources)

Anatomy of the thyroid gland

Location

- The thyroid is a **highly vascular** brownish-red gland .
- located and forms the floor of the anterior triangle of the neck.
- It is composed of **two lobes** (levels with C5 to T1)
- connected by an **isthmu**s that overlies 2nd , 3rd and 4th tracheal rings situated 2cm deep



Anatomy of thyroid gland

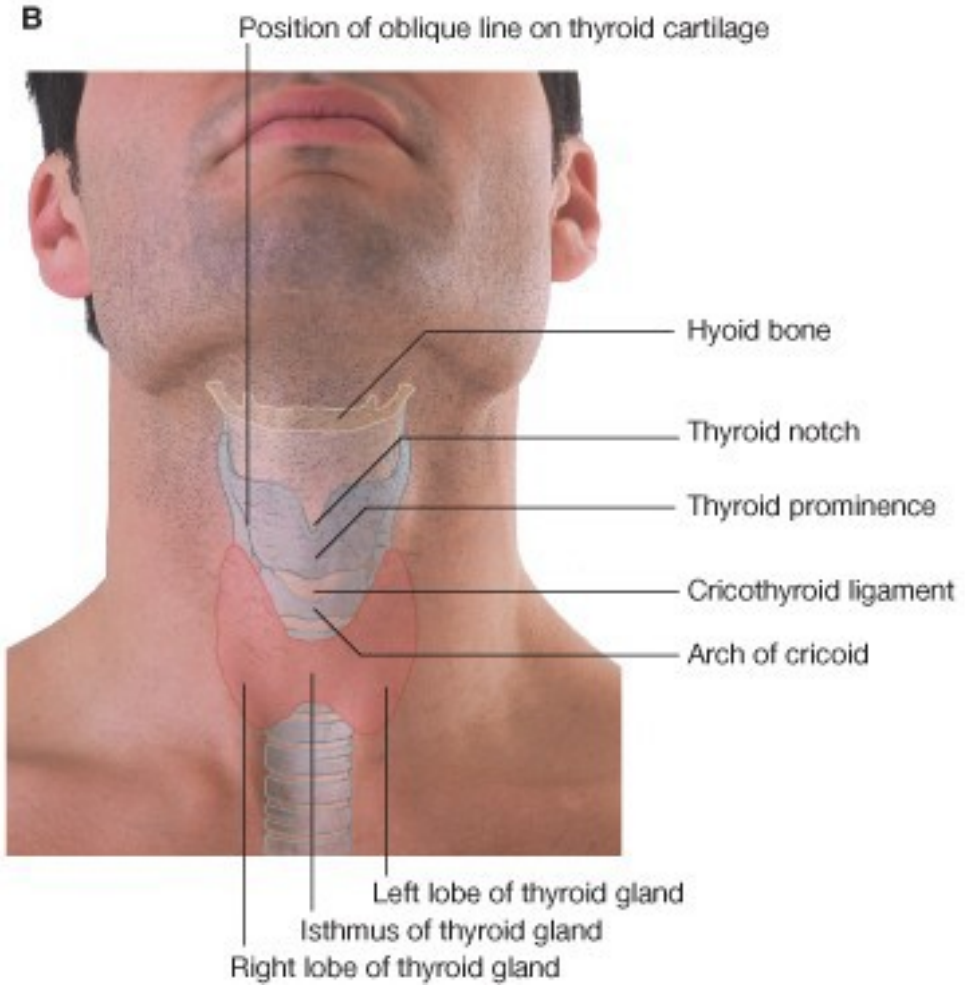
Anatomy..

Covering

- It is covered by pre-tracheal sheath, part of the fascial layer which invests the trachea – moves during swallowing.
- It also has a true capsule which is adherent to the gland and cannot be separated from it.
- This fascia coalesces with the thyroid capsule posteriorly and laterally to form a suspensory ligament, known as the ligament of Berry, attached to cricoid cartilage.
- Between the gland and the sheath is a network of anatomising blood vessels

Anatomy

- Prominent landmarl
  - Hyoid bone
  - Thyroid cartilage
  - Cricoid cartilage
  - Trachea
  - Sternocleidomastoic muscles



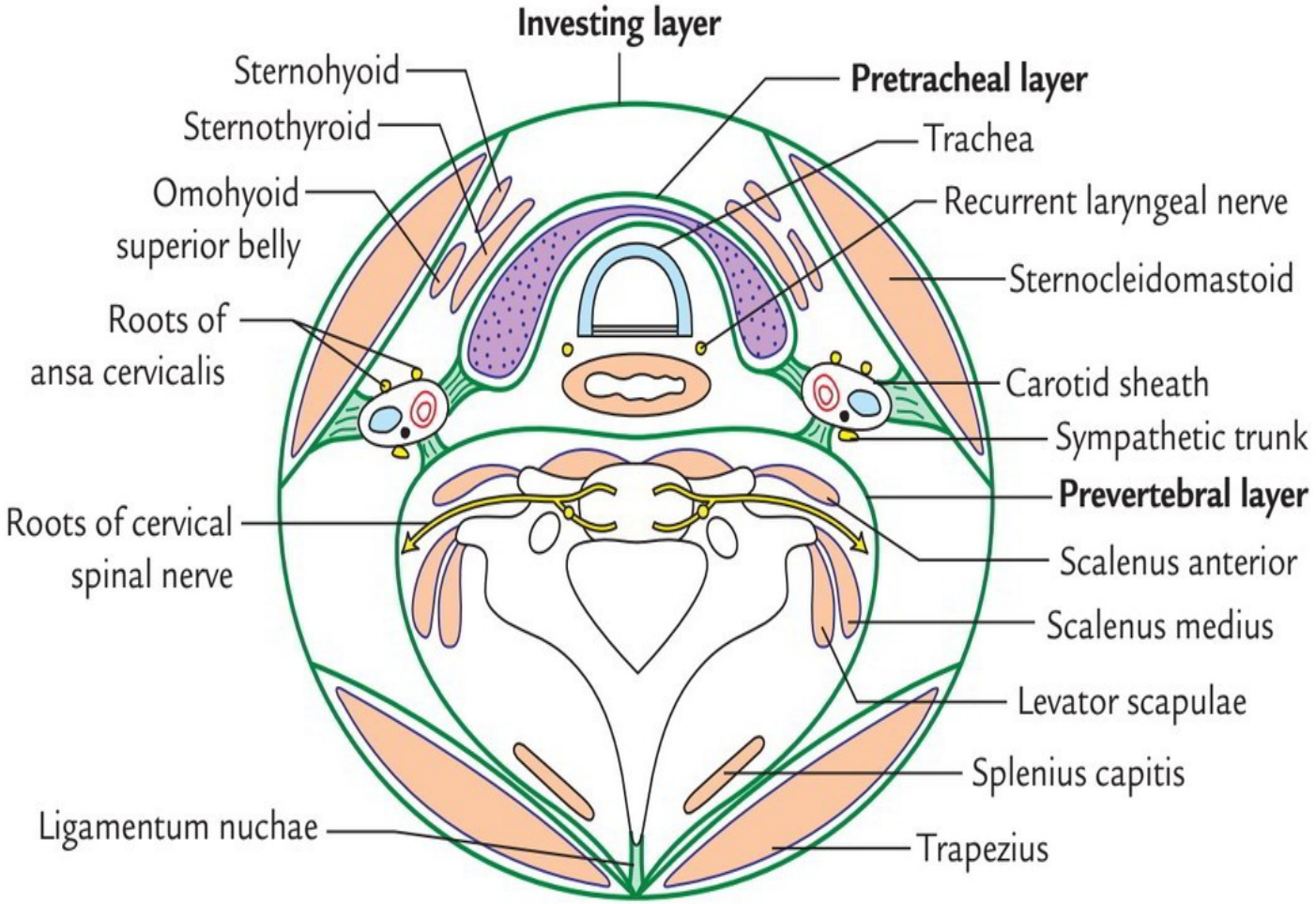
Anatomy..

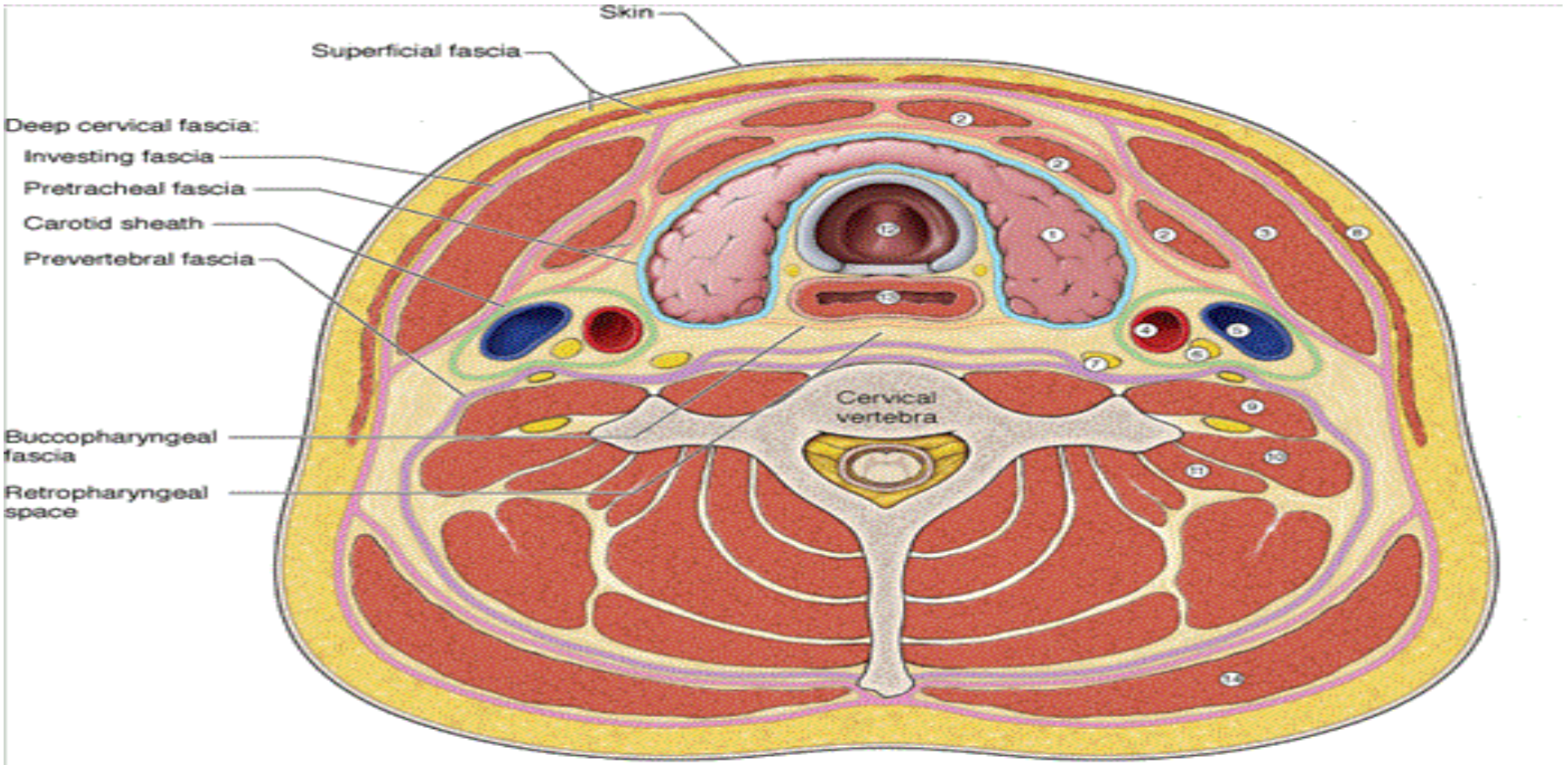
Relations

- **Anterolaterally** – The sternothyroid, superior belly of omohyoid, sternohyoid, and the anterior border of the sternocleidomastoid.

- **Medially**- The larynx, the trachea, the pharynx and the oesophagus. Also cricothyroid muscle and external laryngeal nerve.

- **Posterolaterally**- The Carotid sheath with the common carotid artery, internal jugular vein and the vagus nerve


Investing layer
Sternohyoid
Sternothyroid
Omohyoid
superior belly
Roots of
ansa cervicalis
Roots of cervical
spinal nerve
Ligamentum nuchae
Pretracheal layer
Trachea
Recurrent laryngeal nerve
Sternocleidomastoid
Carotid sheath
Sympathetic trunk
Prevertebral layer
Scalenus anterior
Scalenus medius
Levator scapulae
Splenius capitis
Trapezius



KEY

1. Thyroid gland
2. Infrahyoid mm.
3. Sternocleidomastoid m.
4. Common carotid a.
5. Internal jugular v.
6. Vagus n.
7. Sympathetic trunk
8. Platysma m.
9. Ant. scalene m.
10. Mid. scalene m.
11. Post. scalene m.
12. Trachea
13. Esophagus
14. Trapezius m.

Source: Morton DA, Foreman KB, Albertine KH: *The Big Picture: Gross Anatomy:* www.accessmedicine.com

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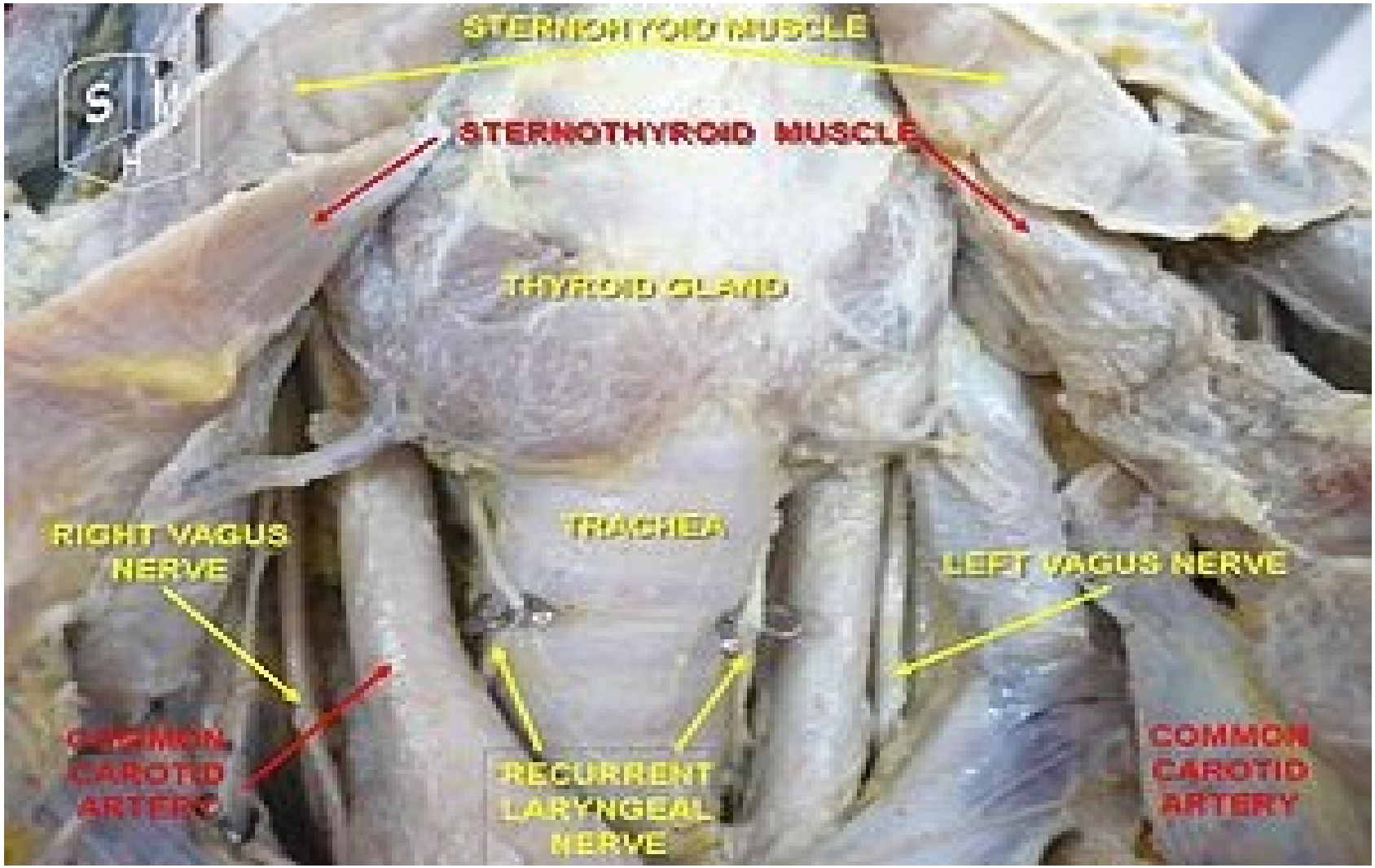
Anatomy

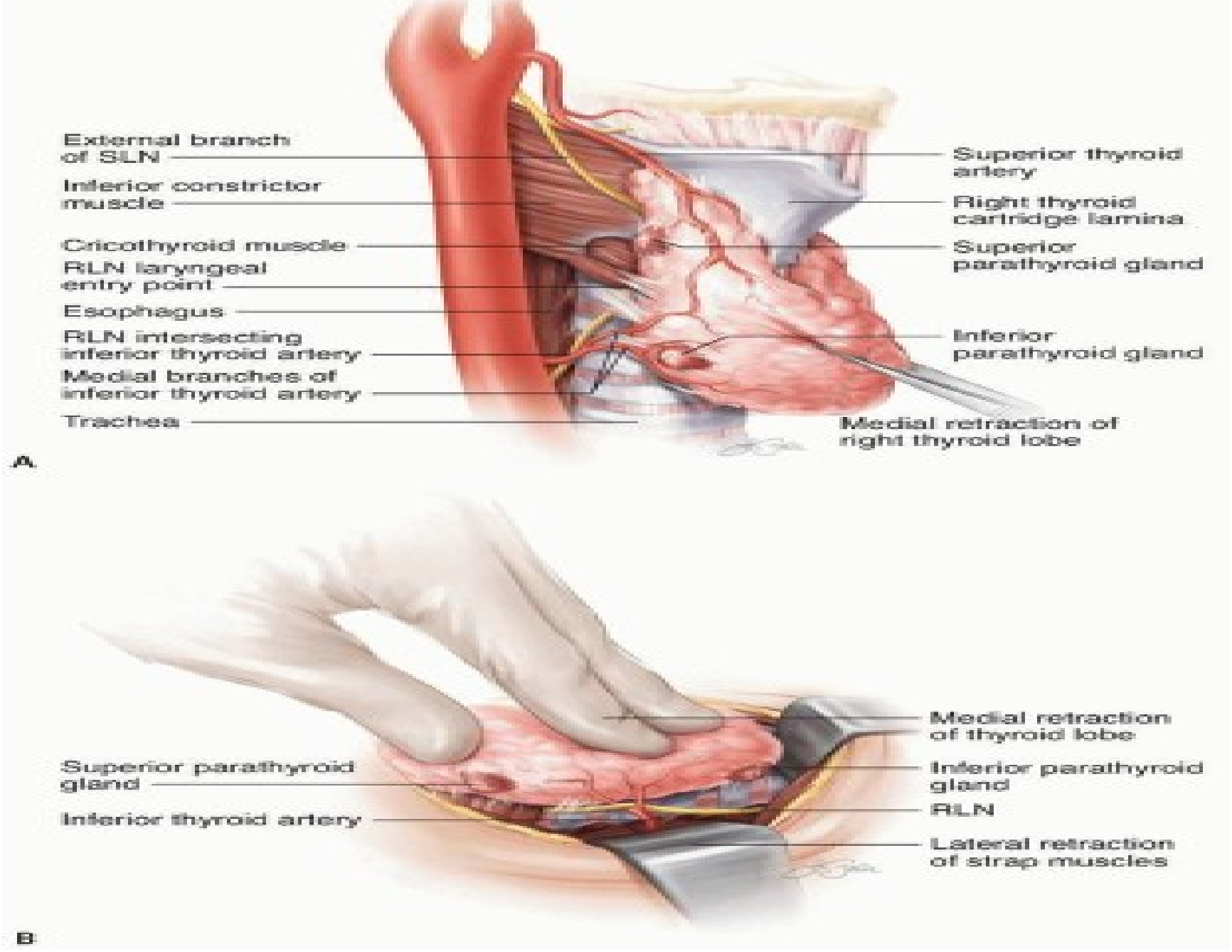

STERNOHYOID MUSCLE
STERNOTHYROID MUSCLE
THYROID GLAND
RIGHT VAGUS NERVE
TRACHEA
LEFT VAGUS NERVE
COMMON CAROTID ARTERY
RECURRENT LARYNGEAL NERVE
COMMON CAROTID ARTERY

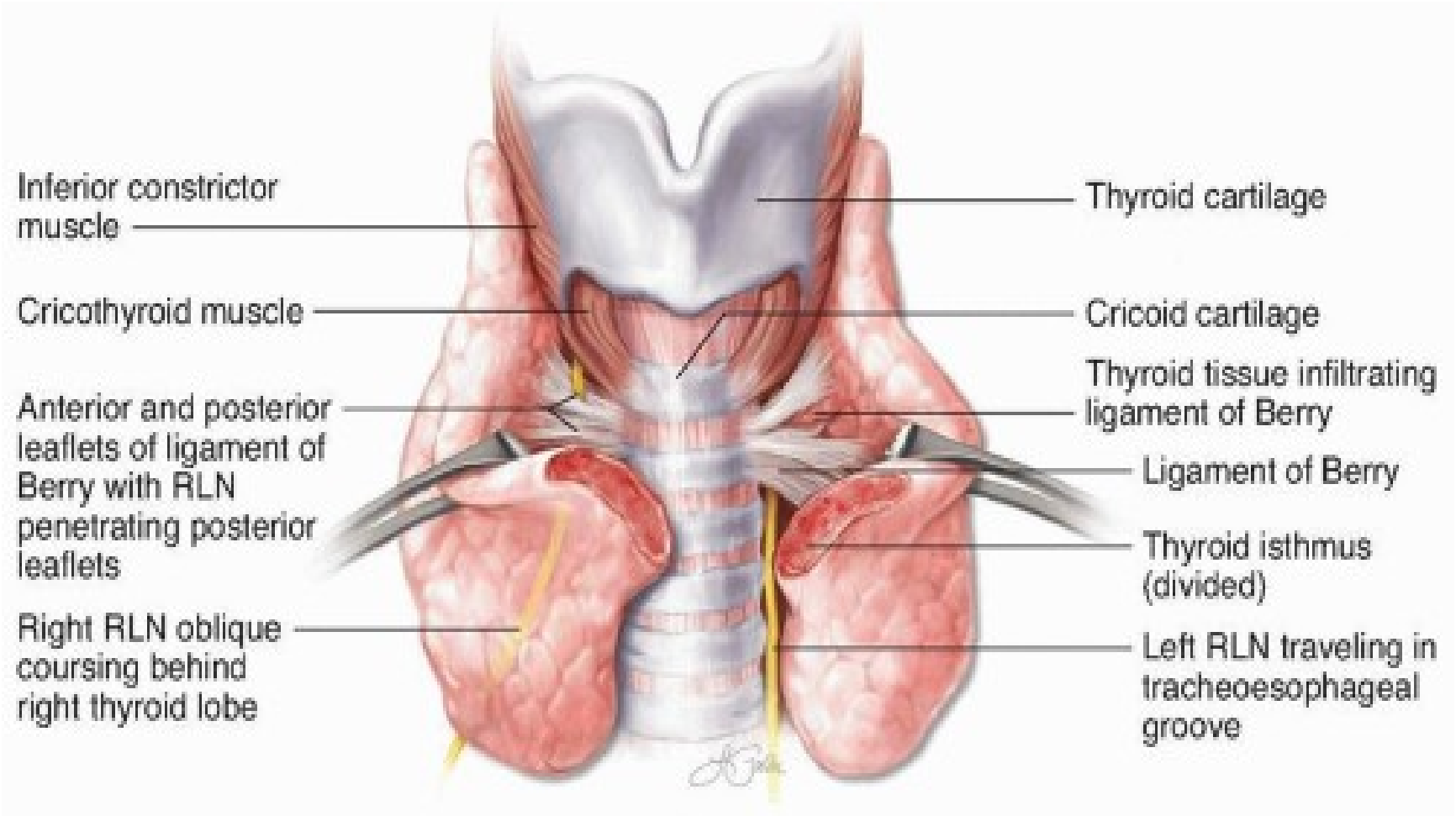
Anatomy

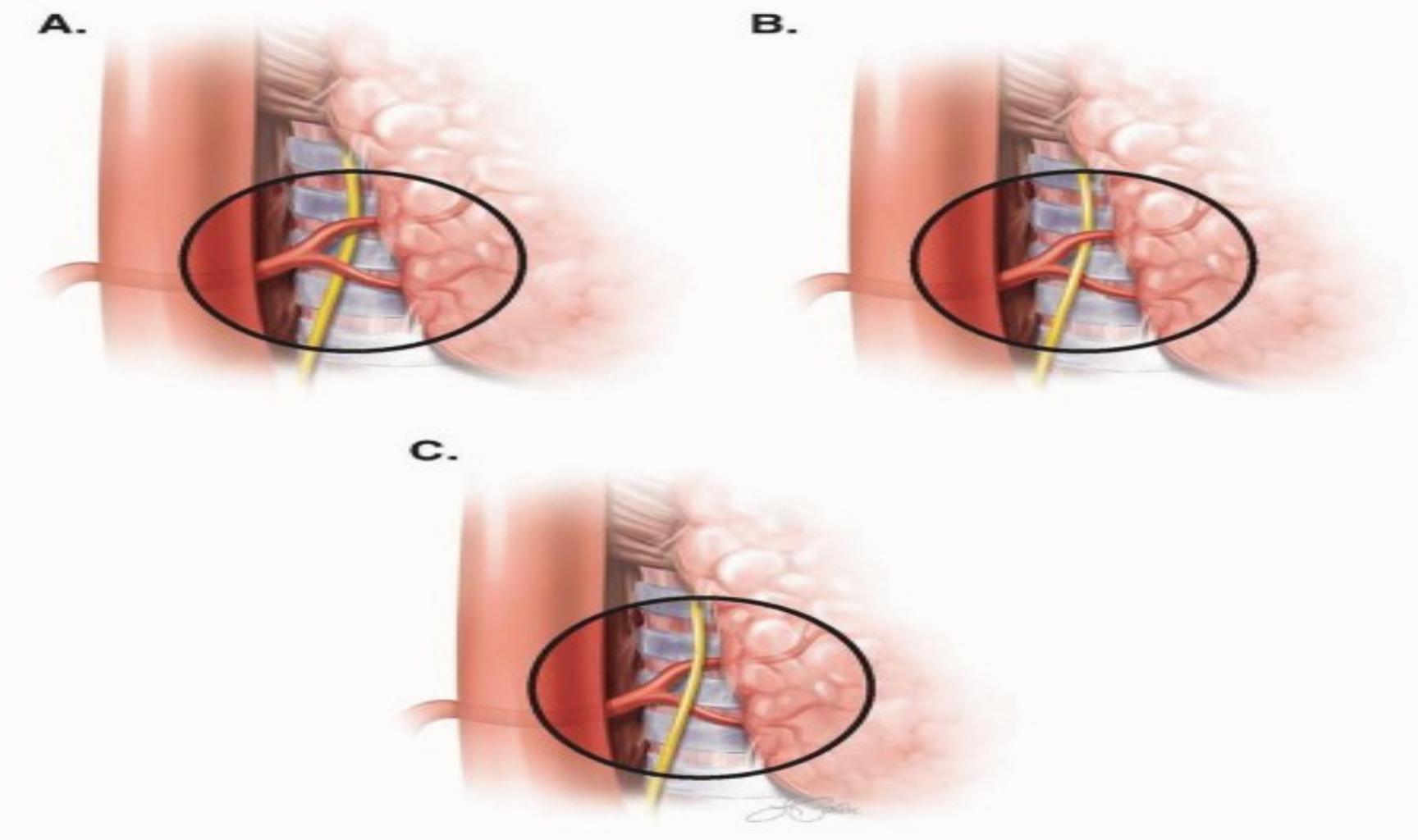
- Recurrent Laryngeal Nerve
  - ✓Ascends on either side of trachea, lies lateral to ligament of berry
- In about 25% of patients the recurrent laryngeal nerve is contained within the ligament as it enters the larynx.
- On the right side, the recurrent laryngeal nerve separates from the vagus as it crosses the subclavian artery, it then passes posteriorly and ascends in a lateral position to the trachea along the tracheoesophageal groove.

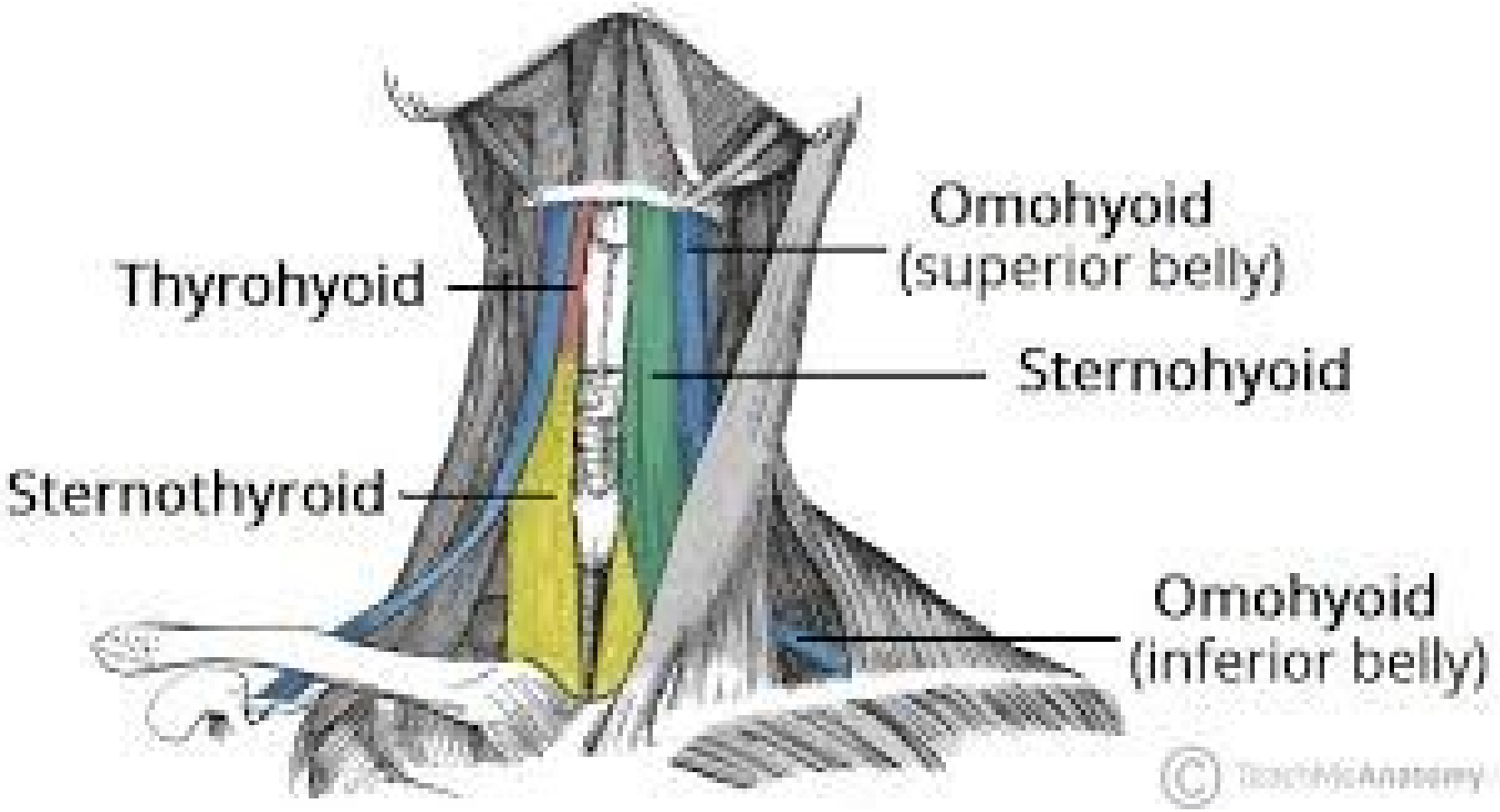
Anatomy

- On the left side, the recurrent laryngeal nerve separates from the vagus as that nerve traverses over the arch of the aorta.


External branch of SLN
Inferior constrictor muscle
Cricothyroid muscle
RLN laryngeal entry point
Esophagus
RLN intersecting inferior thyroid artery
Medial branches of inferior thyroid artery
Trachea
Superior thyroid artery
Right thyroid cartridge lamina
Superior parathyroid gland
Inferior parathyroid gland
Medial retraction of right thyroid lobe
A
Superior parathyroid gland
Inferior thyroid artery
Medial retraction of thyroid lobe
Inferior parathyroid gland
RLN
Lateral retraction of strap muscles
B


Inferior constrictor muscle
Cricothyroid muscle
Anterior and posterior leaflets of ligament of Berry with RLN penetrating posterior leaflets
Right RLN oblique coursing behind right thyroid lobe
Thyroid cartilage
Cricoid cartilage
Thyroid tissue infiltrating ligament of Berry
Ligament of Berry
Thyroid isthmus (divided)
Left RLN traveling in tracheoesophageal groove


A.
B.
C.


Omohyoid
(superior belly)
Thyrohyoid
Sternohyoid
Sternothyroid
Omohyoid
(inferior belly)

Blood supply

- Superior thyroid artery- first branch of external carotid artery- Lies in close relation to external Laryngeal nerve near its termination.
- Inferior thyroid artery- a branch from thyrocervical trunk (subclavian). Medial border of Scalenus to the middle of back of the gland.
- Thyroidae Ima- in <5% of cases from innominate artery or aorta.

INFERIOR THYROID ARTERY

- The inferior thyroid artery has important anatomic relationships.
- The recurrent laryngeal nerve is usually directly adjacent (in either an anterior or posterior position) to the inferior thyroid artery, within 1 cm of its entrance into the larynx.
- Careful dissection of the artery in this case is mandatory and cannot be completed until knowledge of the position of the recurrent laryngeal nerve is absolute.
- Additionally, the inferior thyroid artery almost always supplies both the superior and inferior parathyroid glands, and care must be taken to evaluate the parathyroids after division of the

Venous drainage

- Three pairs of venous systems drain the thyroid.
- Superior venous drainage is adjacent to the superior arteries and joins the internal jugular vein at the level of the carotid bifurcation.
- Middle thyroid veins exist in more than half of patients and course immediately laterally into the internal jugular vein.
- The inferior thyroid veins are usually two or three in number and descend directly from the lower pole of the gland into the innominate and brachiocephalic veins.

Anatomy cont..

- Often a long, narrow projection of thyroid tissue extending upward from the isthmus and lying on the surface of the thyroid cartilage forms a **pyramidal lobe**.
- It represents a vestige of the embryonic thyroglossal duct, and it often becomes palpable in cases of thyroiditis.
- The normal thyroid varies in size in different parts of the world, depending on the iodine content in the diet (apprx 15gms in US)

LYMPHATIC DRAINAGE

- Upper deep cervical lymph nodes .
- Lower deep cervical lymph nodes.

NERVE SUPPLY:

- Mainly by **middle cervical** ganglion and partly from superior and inferior cervical ganglia.

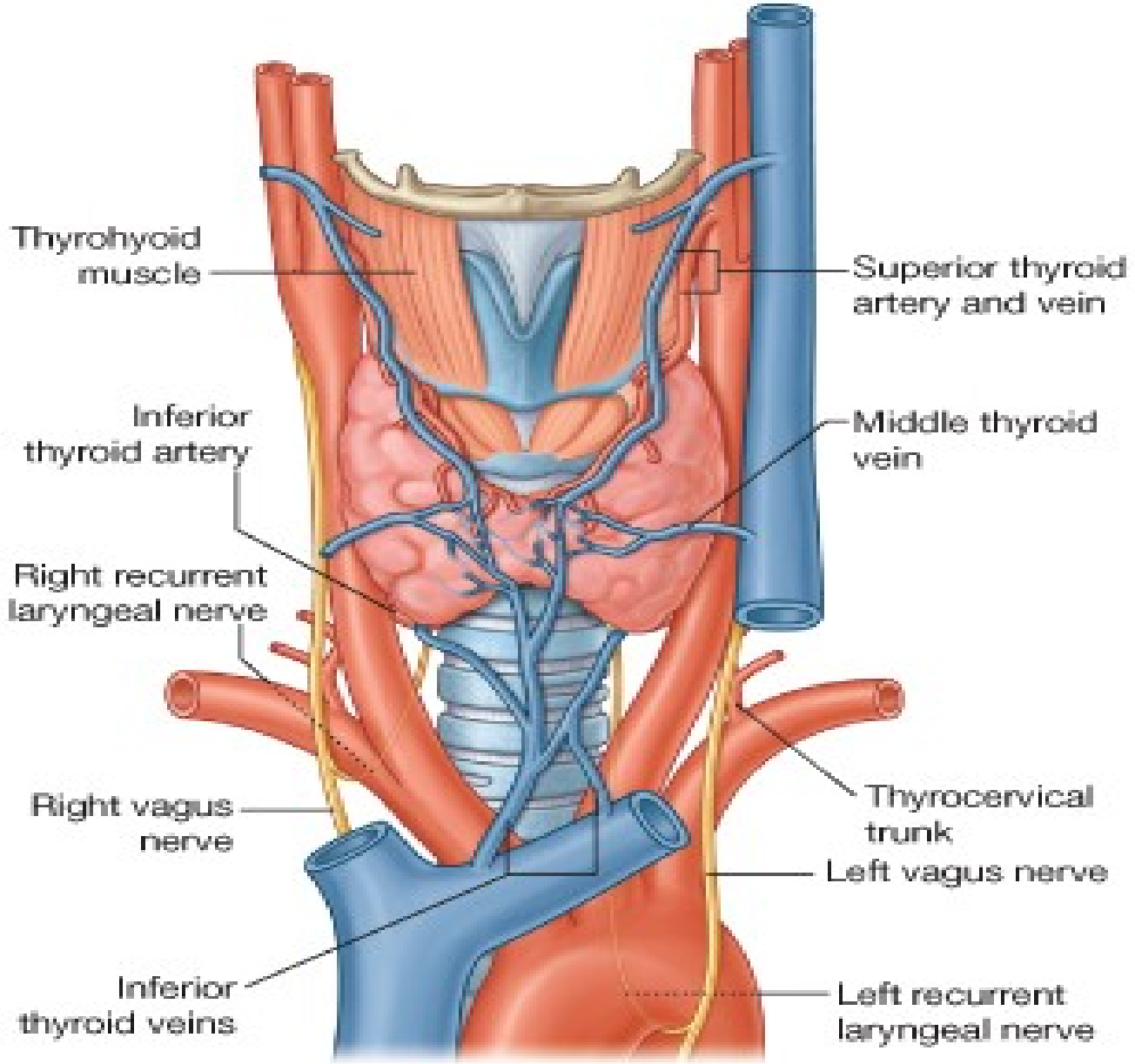


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Figure 8.169 Vasculature of the thyroid.

III. Physiology of the thyroid gland

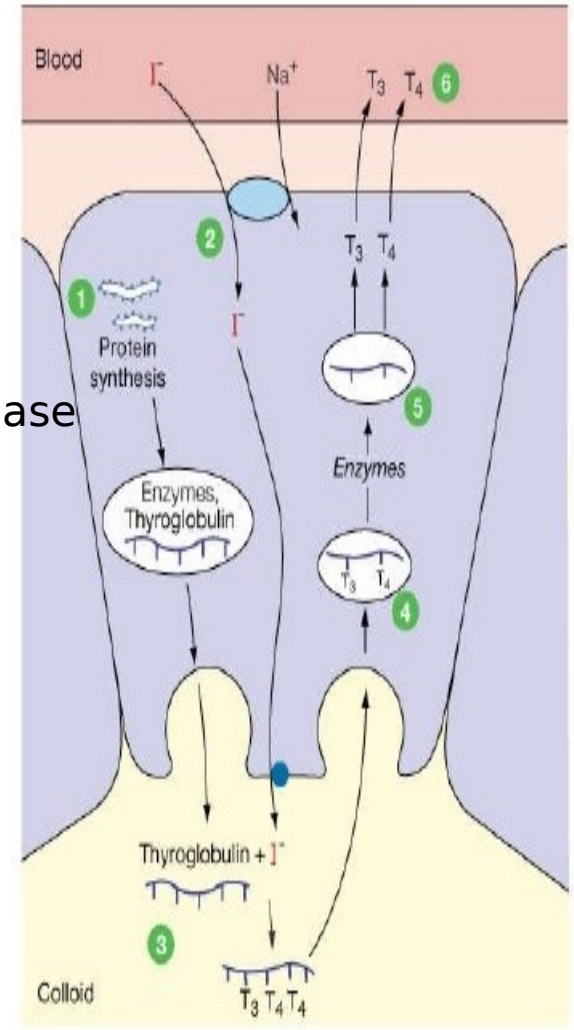
- The thyroid gland weighs 10 to 20 g in normal adults and is responsible for the production of two families of metabolic hormones:
  - Thyroxine (T_4)
  - Triiodothyronine (T_3)
  - Calcium-regulating hormone calcitonin

THYROID HORMONE SYNTHESIS Cont…

5steps

1. **Trapping –I $^-$ pump**
2. **Oxidation – I_2**
3. **Organification- T-I**
4. **Coupling- DIT/MIT+DIT,**
5. **Storage and Secretion**

Iodide peroxidase



1. Follicular cell synthesizes enzymes and thyroglobulin for colloid.
2. I^- is co-transported into the cell with Na^+ and transported into colloid.
3. Enzymes add iodine to thyroglobulin to make T_3 and T_4.
4. Thyroglobulin is taken back into the cell.
5. Intracellular enzymes separate T_3 and T_4 from the protein.
6. Free T_3 and T_4 enter the circulation.

Figure 23-9: Thyroid hormone synthesis

Physiology cont.

Iodine Metabolism

- Iodine is essential for normal thyroid function. It can be efficiently absorbed from the gastrointestinal tract in the form of inorganic iodide and rapidly enters the extracellular iodide pool.
- The thyroid gland is responsible for storing 90% of total body iodide at any given time, with less than 10% existing in the extracellular pool

Physiology cont.

- Thyroid Hormone Synthesis
  - Once organic iodide is efficiently oxidized and bound, it couples to thyroglobulin (Tg) with tyrosine moieties to form iodotyrosines in either a single conformation (monoiodotyrosine [MIT]) or a coupled conformation (diiodotyrosine [DIT])

Physiology cont.

- MIT and DIT are biologically **inert.**
- Coupling of these two residues gives rise to the two biologically active thyroid hormones T_4 and T_3.
- T_4 is formed by coupling of two molecules of DIT, whereas T_3 is formed by coupling of a molecule of MIT with a molecule of DIT.
- In normal circumstances, formation of T_4 is the major pathway.

Physiology cont.

Regulation of Thyroid Hormone Secretion

Triiodothyronine and Thyroxine

- The hypothalamic-pituitary-thyroid axis regulates thyroid hormone production and release in a classic endocrine feedback system.
- The major regulator of thyroid gland activity is the glycoprotein TSH, which is a major growth factor for the thyroid.
- TSH stimulates thyroid cell growth and differentiation, as well as iodine uptake and organification and release of T_3 and T_4 from Tg.

Physiology cont.

- The feedback loop is an important regulator of TSH secretion.
- Increased thyrotropin-releasing hormone (TRH) from the paraventricular nucleus of the hypothalamus and reduced levels of T_3 stimulate release of TSH from the anterior pituitary

Physiology cont.

Calcitonin

- Calcitonin is a 32–amino acid polypeptide that is secreted by the parafollicular cells, or C cells, located superolaterally in each thyroid lobe.
- Calcitonin acts principally to inhibit calcium absorption by osteoclasts and thereby to lower peripheral serum calcium levels.
- Increased peripheral levels of serum calcium stimulate calcitonin secretion.
- Calcitonin secretion can be stimulated clinically by infusion of calcium, pentagastrin, and alcohol.

Physiology cont.

Inhibition of Thyroid Synthesis

- Drugs
- Antithyroid medications are an option for the treatment of thyroid excess states.
- The thionamide class of antithyroid drugs includes propylthiouracil (PTU) and methimazole (Tapazole).
- This class of drugs acts by inhibiting the organification and oxidation of inorganic iodine, as well as by inhibiting linkage of the initial iodotyrosine molecules MIT and DIT

Physiology cont.

Iodine

- Iodine, given in large doses after the administration of an antithyroid medication, can inhibit thyroid hormone release by altering the organic binding process (Wolff-Chaikoff effect).
- This stunning effect is transient; however, iodine supplementation can be used to treat hyperactivity of the gland in preparation for surgery.

Physiology cont.

Corticosteroids

- Exogenous glucocorticoids can effectively suppress the pituitary-thyroid axis. Additionally, they can act in the periphery to inhibit peripheral conversion of T_4 to T_3.
- This effectively lowers serum T_3 levels, thus allowing steroids to be used as a rapid inhibitory agent in hyperthyroid conditions. Steroids can also lower serum TSH.

Common Thyroid diseases

1. Simple Goiter (euthyroid**)**

-diffuse hyperplasia (e.g physiological, pubertal or in pregnancy)

-nodular (solitary or multinodular)

2. Toxic Goiter

-diffuse (e.g Grave's disease)

-nodular goitre

-toxic nodule

Common Thyroid diseases cont..

3. **Neoplastic**
   - -benign
   - -malignant
4. **Inflammatory**
   - -Autoimmune (e.g chronic lymphocytic thyroiditis)
   - -Infective (e.g bacterial and/or viral thyroiditis)
   - -amyloidosis

TYPES OF THYROID DISORDERS

1. HYPERTHYROIDISM	2. HYPOTHYROIDISM
Too **MUCH** Thyroid Hormone	Too **LITTLE** Thyroid Hormones
-Graves Disease -Thyrotoxicosis - Thyroiditis	- Cretinism - Hashimoto Thyroiditis - Myxedema

GOITRE

-Enlarged thyroid gland

Hyperthyroidism

- Disease processes associated with increased thyroid secretion result in a predictable hypermetabolic state.
- Primary alterations within the gland (clinical types);

✓ Graves' disease,

✓ toxic nodular goiter,

✓ Jod-Basedow's disease

✓ toxic thyroid adenoma

✓ central nervous system disorders and increased TSH-produced stimulation of the thyroid.

- Other causes, Unusual:

• Mismanaged exogenous thyroid ingestion, molar pregnancy , thyroid malignancy with overproduction of thyroid

Grave's disease

- The most common cause of hyperthyroidism (diffuse toxic goiter).
- Described by an Irish physician, Dr. Robert Graves, in 1835.
- Women between the ages of 20 and 40 years are most commonly affected.
- The hyperthyroidism is caused by stimulatory autoantibodies to TSH-R.

Pathophysiology of Graves' Disease

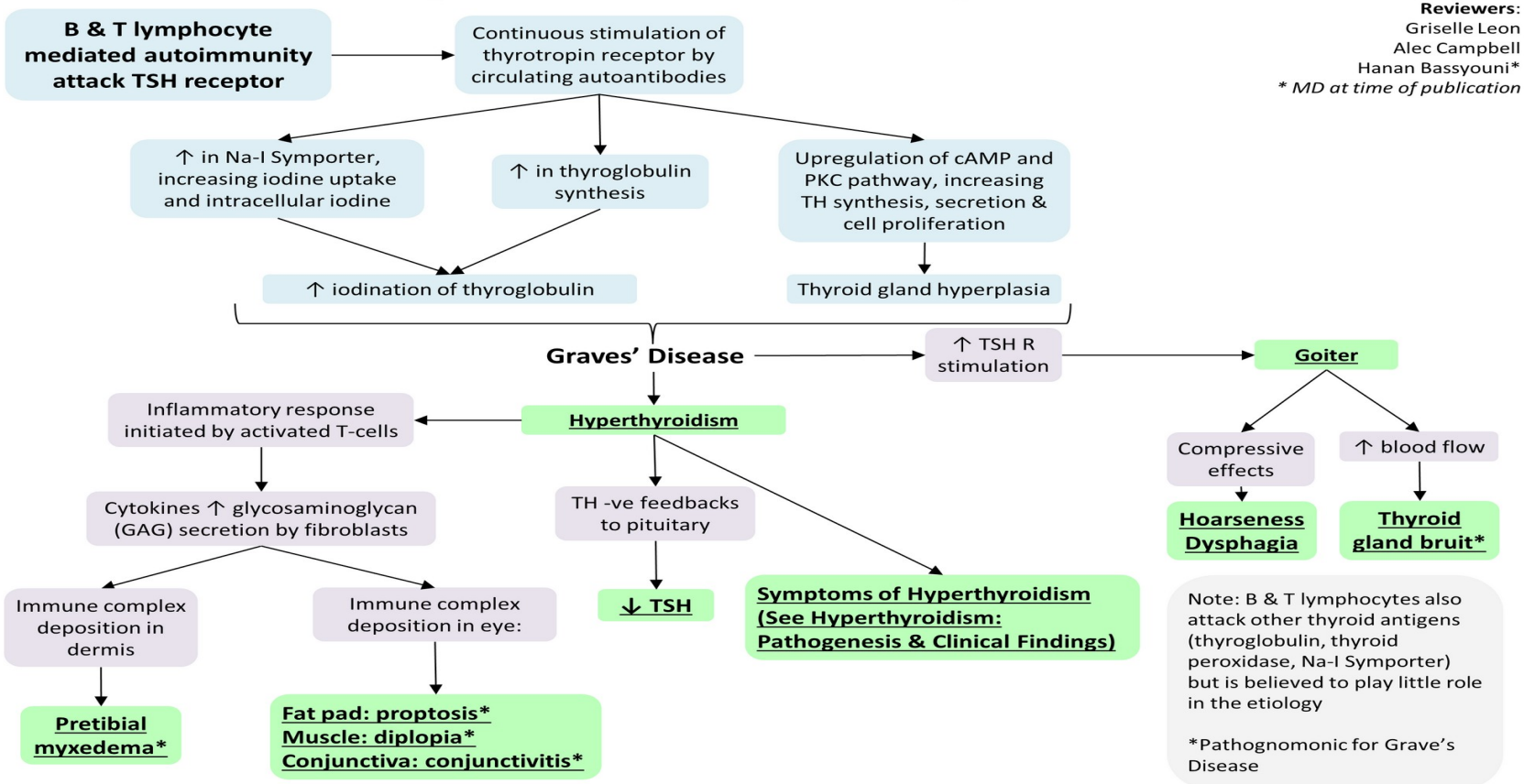
- **1. Genetic Susceptibility**
- **HLA associations** (e.g., *HLA-DR3*, *HLA-B8*) increase risk.
- **Non-HLA genes** (*CTLA-4, PTPN22, TSHR*) contribute to immune dysregulation.
- **Family history** – Higher risk if relatives have Graves’ or other autoimmune diseases (e.g., Hashimoto’s, type 1 diabetes).
- **2. Environmental Triggers**
- **Infection** (e.g., *Yersinia enterocolitica* has TSHR-like proteins → molecular mimicry).
- **Smoking** (strongly linked to Graves’ ophthalmopathy).
- **Stress** (alters immune regulation).
- **Iodine excess** (triggers autoimmunity in predisposed individuals).
- **Sex hormones** (females 5–10× more affected; pregnancy/postpartum flares).

Pathophysiology….

- **3. Autoimmune Dysregulation**
- **Loss of T-cell tolerance** → Autoreactive **Th2 cells** stimulate B-cells to produce **thyroid-stimulating immunoglobulins (TSIs)**.
- **TSIs** (IgG antibodies) bind **TSH receptors (TSHR)** → **constitutive activation**.
- **4. Thyroid Hyperstimulation**
- **Uncontrolled TSH receptor signaling** → **excess T3/T4 synthesis**.
- **Thyroid hyperplasia** → **diffuse goiter** (enlarged thyroid with vascular bruit).
- **5. Hyperthyroidism Manifestations**
- ↑ **Metabolic rate** → weight loss, heat intolerance, tremors.
- ↑ **Adrenergic activity** → tachycardia, palpitations, anxiety.
- **Thyrotoxicosis** (severe cases → arrhythmias, cardiac failure).
- **6. Extrathyroidal Effects**
- **Graves' ophthalmopathy** (TSIs target orbital fibroblasts → inflammation, glycosaminoglycan accumulation → proptosis, diplopia).
- **Dermopathy (pretibial myxedema)** – Skin thickening due to autoimmune fibroblast activation.

Graves' Disease: *Pathogenesis and Clinical Findings*

Authors:
Ashley Hinther
Reviewers:
Griselle Leon
Alec Campbell
Hanan Bassyouni*
** MD at time of publication*


B & T lymphocyte mediated autoimmunity attack TSH receptor
Continuous stimulation of thyrotropin receptor by circulating autoantibodies
↑ in Na-I Symporter, increasing iodine uptake and intracellular iodine
↑ in thyroglobulin synthesis
Upregulation of cAMP and PKC pathway, increasing TH synthesis, secretion & cell proliferation
↑ iodination of thyroglobulin
Thyroid gland hyperplasia
Graves' Disease
↑ TSH R stimulation
Goiter
Hyperthyroidism
Inflammatory response initiated by activated T-cells
Cytokines ↑ glycosaminoglycan (GAG) secretion by fibroblasts
Immune complex deposition in dermis
Pretibial myxedema*
Immune complex deposition in eye:
Fat pad: proptosis*
Muscle: diplopia*
Conjunctiva: conjunctivitis*
TH -ve feedbacks to pituitary
↓ TSH
Symptoms of Hyperthyroidism (See Hyperthyroidism: Pathogenesis & Clinical Findings)
Compressive effects
Hoarseness
Dysphagia
↑ blood flow
Thyroid gland bruit*
Note: B & T lymphocytes also attack other thyroid antigens (thyroglobulin, thyroid peroxidase, Na-I Symporter) but is believed to play little role in the etiology
*Pathognomonic for Grave's Disease

Legend: Pathophysiology | Mechanism | Sign/Symptom/Lab Finding | Complications

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Grave’s disease..

Pathology

- Microscopically, the follicles are small with hyperplastic columnar epithelium.
- Hyperplasia of these cells is exhibited by rapidly dividing nuclei and papillary projections of the follicular epithelium within the central follicles.
- Increased deposition of lymphoid tissue is also demonstrable in many patients with Graves' disease.

System Symptoms

- *Nervous system*

Nervousness agitation, irritability,insomnia, nervous instability, tremor of the hands and tongue

- *Cardiovascular* Palpitation, dyspnea on exertion, chest pain, etc.
- *Metabolic*

Increase in appetite and loss of weight, change in bowel habit usually diarrhea; preference for cold weather; excessive sweating;intolerance to hot weather

System Symptoms cont..

- *Menstrual changes*

Usually amenorrhea or oligomenorrhea

- *Musculoskeletal*

Generalized weight loss; wasting and weakness of small muscles of the hand, shoulder and face.

- *Skin:* Pretibial myxedema
- *Nail:* Onycholysis—Plummer's nail.

Signs

1. Uniform, smooth, soft or firm enlargement of thyroid in Graves' disease (primary) bosselated swelling or solitary nodule in case of secondary
2. The gland is vascular as evidenced by bruit
3. Tremor of the outstretched hands (fine, fast) and tongue
4. Warm and moist hands
5. Tachycardia
6. Extra systoles, atrial fibrillation, and cardiac failure
7. Eye signs
8. Myopathy — weakness of the proximal limb muscle is commonly found. Severe muscular weakness resembling myasthenia gravis occurs occasionally.

- Inability to get up from chair is called Plummer's sign.

Eye signs

1. *Lid rectraction* (this is not exophthalmos)
2. *Lid lag (Von Graefe's sign)—*
3. *Exophthalmos*

4. The other eye signs are:

a. Widening of the palpebral fissure (Stellwag's sign) this is due to lid retraction

b. Joffroy's sign—absence of wrinkling of the forehead when the head is bent down

c. Möbius's sign—difficulty in convergence when the patient is asked to look at near objects

5. *Severe exophthalmos*

—Intraorbital edema is super added to the increased deposition of intraorbital fat. It comprises of:

a. Intraorbital congestion—watering of eyes,dilated blood vessels in lateral conjunctiva

b. Increased intraocular tension

c. Muscle paralysis (Ophthalmoplegia)—evidenced by double vision, especially when eye is moved upward end and outwards (muscles of elevation and abduction namely, superior rectus and inferior oblique muscles are affected)

d. Chemosis.

Grave's disease..

Diagnosis

- A cost-effective workup can include an **extensive history, physical examination, and thyroid function tests**.
- In addition to elevated levels of **T_3 and T_4, a decreased or undetectable level of TSH i**s demonstrated.
- Thyroid antibodies are usually detected in elevated quantities.
- An ^{123}I radionuclide scan demonstrates diffuse uptake throughout an enlarged gland.
- Ultrasound or computed tomography (CT) of the neck can be used to evaluate clinical landmarks

Treatment of Grave's disease..

- Therapy is initiated rapidly to ameliorate symptoms and decrease thyroid hormone synthesis

1. β-blocker therapy
2. Antithyroid Medication (Propylthiouracil(PTU) and methimazole)
3. Radioactive iodine ablation
4. Surgery

Toxic Nodular Goiter/Toxic Adenoma

- Also known as Plummer's disease, excess production of thyroid hormones from functionally autonomous thyroid nodules, which do not require stimulation from thyroid stimulating hormone (TSH).
- It usually occurs in the setting of a patient with endemic goiter.(hence called secondary)
- Such patients generally have a milder course and are older than those with Graves' disease.
- The thyroid in these patients may be diffusely enlarged or associated with retrosternal goiters**.**

Dx- TFT- elevated,decreased antithyroid, ^{131}I radionuclide scan

Rx- Toxic nodular goiter can be treated with thionamides, radioiodine therapy, or surgery.

Non toxic goitre

Multinodular Goiter

- Is an enlarged, diffusely heterogeneous thyroid gland.
- Initial findings asymmetric nodularity of the mass often develops usually iodine deficiency.
- Initially the mass is euthyroid, but with increasing size, elevations in T_3 and T_4 can occur and gradually progress to clinical hyperthyroidism.
- The incidence of carcinoma in multinodular goiter has been reported to be 5% to 10%.
- Dx-**FNAC**

  TFT

Thyroiditis

Acute Suppurative Thyroiditis

- Acute suppurative thyroiditis is extremely rare and usually the result of a severe pyogenic infection of the upper airway.
- The process results in severe localized pain and is generally unilateral.
- Abscess drainage followed by the administration of antibiotics is effective, and long term deleterious effects on thyroid function rarely result

Thyroiditis

Hashimoto's Thyroiditis

- The major cause of hypothyroidism.
- A complex immunologic phenomenon results in the formation of immune complexes and complement in the basement membrane of follicular cells.
- This leads to alterations in thyroid cell function that impair T_3 and T_4 production.

Pathophysiology of Hashimoto Thyroiditis (Chronic Lymphocytic Thyroiditis)

- **1. Genetic Predisposition**
- **HLA associations**: *HLA-DR3, HLA-DR4, HLA-DR5* (varies by ethnicity).
- **Non-HLA genes**: *CTLA-4, PTPN22, FOXP3* (regulatory T-cell dysfunction).
- **Family history**: Strong link with other autoimmune diseases (Type 1 DM, SLE, Graves').
- **2. Environmental Triggers**
- **Excess iodine** (triggers autoimmunity in susceptible individuals).
- **Infection** (viral/bacterial mimicry, e.g., *H. pylori*, Epstein-Barr virus).
- **Radiation exposure** (increases thyroid antigen release).
- **Sex hormones** (♀ 10× more affected; postpartum thyroiditis variant).

Pathophysiology…

- **3. Autoimmune Attack**
- **Loss of self-tolerance → CD4+ T-cells (Th1 dominant)** infiltrate thyroid.
- **Autoantibodies**:
  - **Anti-thyroid peroxidase (TPO)** (most common, ~95%).
  - **Anti-thyroglobulin (Tg)** (~60-80%).
- **Cytotoxic CD8+ T-cells** → Direct destruction of thyroid follicular cells.
- **4. Thyroid Destruction & Hypothyroidism**
- **Chronic inflammation** → Lymphocytic infiltration ("**Hurthle cells**," oncocytic change).
- **Fibrosis** (late-stage gland atrophy).
- **Progressive loss of thyroid function → hypothyroidism** (fatigue, weight gain, cold intolerance, bradycardia).
- **5. Goiter Formation (Early Disease)**
- **Compensatory TSH elevation** (from failing thyroid) → **diffuse/enlarged thyroid** (goiter).
- **Painless, firm** on palpation (vs. Graves' soft goiter).
- **6. Variants & Complications**
- **Hashitoxicosis** (transient thyrotoxicosis from follicular rupture).
- **Increased risk of thyroid lymphoma** (rare, associated with long-standing disease).

Thyroiditis

Subacute Thyroiditis

- Predominantly in females (2:1) .The mean age of patients is in the 40s in most series.
- Unkown cause, associated with a viral or autoimmune origin.
- Initial history of URTI before the onset of thyroiditis can be elicited.
- Patients have diffuse swelling in the cervical area and a sudden increase in pain
- Fever, weight loss, and severe fatigue are other symptoms.
- FNAC can be diagnostic if it demonstrates giant cells of an epithelioid foreign body type, which characterizes the lesion..

Thyroiditis

Riedel's Struma

- Is a rare entity characterized by a firm thyroid secondary to a chronic inflammatory process involving the entire gland.
- Symptoms of severe discomfort can occur and are due to extension into the trachea, esophagus, and laryngeal nerve.
- As a result, patients may have impending airway obstruction or dysphagia.
- Unilateral involvement of symptoms may suggest a malignancy and lead to surgical intervention.
- Treatment with thyroid hormone replacement.

Thyroid malignancies

Classification and incidence of thyroid malignancies

MALIGNANT TUMOURS OF F. CELLS	
Well-differentiated carcinoma	
Papillary	80%
Follicular(Hurthel cell's 2%)	12%
Undifferentiated carcinoma	
Anaplastic	1%
MALIGNANT TUMOURS OF C. CELLS	
Medullary	5%
MALIGNANT NON-EPITHELIAL T.	
Lymphoma	1%
MSCELLANEOUS	
Sco, secondary tumours	<1%

Classification and incidence of thyroid malignacies

MALIGNANT TUMOURS OF F. CELLS	
Well-differentiated carcinoma	
Papillary	80%
Follicular Hurthel cell's Papillofollicular	12% 3%
Undifferentiated carcinoma	
Anaplastic	1%
MALIGNANT TUMOURS OF C. CELLS	
Medullary	5%
MALIGNANT NON-EPITHELIAL	

Soka

Thyroid Carcinoma

- Generally estimated that thyroid carcinoma comprises approx. 1% of all malignancies.
- In Europe and the US, about 3 out of 100,000 people develop a thyroid malignancy.
- **In Tanzania**, (Lema LEK, Aziz MR, East and Cent Afr J of Surg 2 (1) 1996)
- Overall freq. of thyroid Ca in operated cases is 6. 8%
- A third of cases presented with STN and two thirds with MNG
- Solitary nodules common in (F) within ages of 20-30 yr.
- Multinodular goitre occur in (F) between 20-59 yr.
- Frequency of Ca reported as 10% in STN and 5% in MNG
- Papillary Ca commoner in STN while follicular Ca in MNG

Differentiated thyroid carcinoma (DTC)

- By WHO, this (DTC) can be subdivided into *papillary thyroid carcinoma (**PTC**) and follicular thyroid carcinoma(**FTC**)*.

- Have different biological behavior which may also be reflected in a somewhat distinct therapeutic approach.

- Both *papillary and follicular thyroid carcinoma are of* epithelial origin.

Papillary Thyroid Carcinoma (PTC)

- Is the predominant form of thyroid carcinoma 80% (> in areas with **sufficient dietary iodine**)
- May occur at any age, but has a peak incidence in the **3th and 4th decades**.
- Female: male ratio = 3:1
- common in iodine sufficient area
- High risk is irradiation exposure
- Spread ismaily by lymphatic (haematogenous rare), hence tends to remain localized in the thyroid

- However the disease may be aggressive in **children**
- They are mostly multicentric with slow growth rate and bilateral in 1/3 of cases
- Most patients are euthyroid and present with a slow-growing painless mass in the neck
- Dysphagia, dyspnea, and dysphonia usually are associated with locally advanced invasive disease
- Lymph node metastases are common, especially in children and young adults, and may be the presenting complaint

- Suspicion of thyroid cancer often originates through physical examination of patients and a review of their history.
- Diagnosis is established by FNAB of the thyroid mass or lymph node.
- Once thyroid cancer is diagnosed on FNAB, a complete neck ultrasound is strongly recommended to evaluate the contralateral lobe and for lymph node metastases in the central and lateral neck compartments.
- Distant metastases are uncommon at initial presentation, but may ultimately develop in up to 20% of patients. The most common sites are lungs, followed by bone, liver, and brain.

- **Pathology**-The diagnosis is established by characteristic nuclear cellular features. Cells are cuboidal with pale, abundant cytoplasm crowded nuclei that may demonstrate “grooving,” and intranuclear cytoplasmic inclusions (leading to the designation of Orphan Annie nuclei
- Psammoma bodies, which are microscopic, calcified deposits representing clumps of sloughed cells, also may be present
- No Tumor marker yet
- TSH sensitive

Fig. 19.27: Papillary carcinoma thyroid presenting as solitary nodule. FNAC gave the correct diagnosis. Total thyroidectomy was done in this patient

Fig. 19.28: This lady underwent total thyroidectomy for MNG. It was reported as PCT. After one year she presented with a solitary lymph node

Fig. 19.29: This lady underwent hemithyroidectomy two years back and came with recurrence in the opposite lobe. Completion thyroidectomy was done

Fig. 19.30: Papillary carcinoma thyroid in a 75-year-old lady—it behaves aggressively in elderly patients. Total thyroidectomy was done (uncommon presentation)

Fig. 19.31: Another case of papillary carcinoma thyroid with huge lymph node secondaries—advanced, neglected case

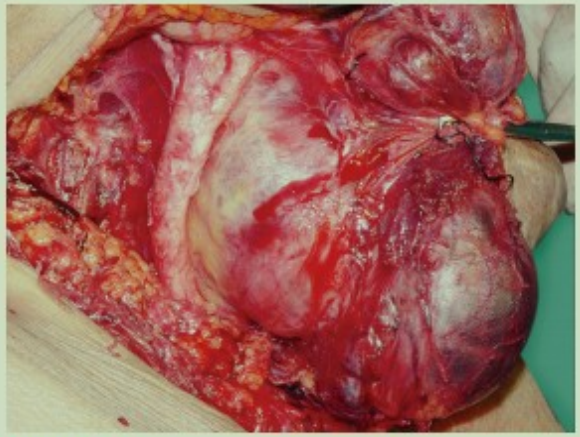


Fig. 19.32: Same patient as in Fig. 19.31—underwent total thyroidectomy with functional block dissection of the neck. *See also* the displacement of carotids

Follicular Thyroid carcinoma (FTC)

- In contrast, FTC is less prevalent than PTC (approximately 10–20% of all thyroid malignancies)
- It is more common in regions with **insufficient dietary iodine**.
- It occurs over a wide age range but is most common in the **5th and 6th** decades.
- Distant metastases are more common by **haematogenous** spread rarely bylymph node and may be the initial symptom.
- Follicular cancers usually present as solitary thyroid nodules, occasion_x0002_ally with a history of rapid size increase, and long-standing goiter
- Follicular carcinoma usually arises in a multinodular
- goitre, especially in cases of endemic goitre. It should

- **Of note**, differentiated thyroid carcinoma may become less differentiated and even undifferentiated in time

- In <1% of cases, follicular cancers may be hyperfunctioning, leading patients to present with signs and symptoms of thyrotoxicosis.
- FNAB is unable to distinguish benign follicular lesions from follicular carcinomas.
- Therefore,preoperative clinical

- Commonly is Metastasis in the flat bones: mostly is the only clinical situation wherein a follicular carcinoma can be considered as the diagnosis is when a patient with a
- thyroid swelling presents with metastasis in the bone
- When bony swelling is obvious and thyroid is not palpable clinically, it is called occult primary site

.The clinical features of secondary in the skull are:

- – They are rapidly growing.
- – They are warm.
- – Vascular and pulsatile
- – Underlying bony erosion may be present
- Large follicular tumors (>4 cm) in older men are more likely to be malignant

- **Pathology**. Follicular carcinomas usually are solitary lesions, and the majority are surrounded by a capsule.
- Histologically, follicles are present, but the lumen may be devoid of colloid.
- Malignancy is defined by the presence of capsular and vascular invasion
- Tumor marker is Thyroglobulin
- TSH sensitive

Mind opening Case

- A patient with a diagnosis of ‘lipoma of the scalp’ was posted for excision in the prone position. As the chief surgeon scrubbed and was about to paint the part, he could see the pulsatile nature of the swelling, which he had missed in the outpatient department. Fortunately, itwas not excised. A needle was introduced and frank blood was aspirated. Surgery was cancelled. X-ray skull showed osteolytic lesion. She had a small thyroid nodule

FOLLICULAR CARCINOMA THYROID—INTERESTING PICTURES (Figs 19.49 to 19.55)

Figs 19.49 and 19.50: This lady presented with thyroid swelling of 5 years' duration with swelling in the scalp and sternum of 2 months duration. Bony swellings were painful—it was a case of follicular carcinoma of thyroid with multiple bony metastasis: **Lady with three swellings**

Fig. 19.51: Ulcerated secondary in the scalp bone from follicular carcinoma thyroid. See dilated veins in the neck. No other differential diagnosis in such patients

Fig. 19.52: This lady, who had undergone hemithyroidectomy for follicular carcinoma thyroid 3 years back, presented with recurrence. Total thyroidectomy could be done

Papillary carcinoma	Follicular ca
multicentric	Multicentricity-uncommon
Spread by regional lymph	Not a prevalent feature(20%)
Angio invasion and distant mets -rare	Vascular invasion - common (50%)
Occult mets found in 70% of specimen	Distant mets in 65%

Hurthle’s cell carcinoma

- Hürthle cell carcinomas account for approximately 3% of all thyroid malignancies and, under the
- World Health Organization classification, are considered to be a subtype of follicular thyroid cancer
- Hürthle cell cancers also are characterized by vascular or capsular invasion and, there_fore, cannot b diagnosed by FNAB
-

- Hürthle cell tumors differ from follicular carcinomas in that they are more often multifocal and bilateral (about 30%), usually do not take up RAI (about 5%), are more likely to metastasize to local nodes (25%) and distant sites(hematogenous), and are associated with a higher mortality rate (about 20% at 10 years).
- Hence, they are considered to be a separate class of tumors by some groups
- Pathology:Same as Follicular
- Tumor marker:Thyroglobulin
- TSH sensitive

Medullary thyroid ca. (MTC)

- Arises from **parafollicular cells**
- Account for 5% of thyroid malignancies
- Early **spread by both** lymphatic and haematogenous routes.
- often present with a neck mass that
- may be associated with palpable cervical lymphadenopathy (15% to 20%).
- Pain or aching is more common in patients with
- these tumors, and local invasion may produce symptoms of dys_x0002_phagia, dyspnea, or dysphonia
- Patients with extensive metastatic disease frequently develop diarrhea, which may result from increased intestinal motility and impaired intestinal water and electrolyte flux
- It is very **aggressive.**
- Two forms exist –**familial** or hereditary and **sporadic.**
- In 20% of cases occur in the setting of MEN II, the rest being sporadic.
- Most secrete calcitonin which constitutes a **chemical marker** of these neoplasm.

MTC cont

- MEN IIa syndrome:
  - Medullary thyroid carcinomas
  - Pheochromocytomas and
  - Parathyroid hyperplasia or adenomas.
- MEN IIb syndrome
  - Medullary thyroid carcinomas
  - Mucosal neuromas and
  - Pheochromocytomas

MTC cont.

- In addition to calcitonin, MTC also produce:-
  - Serotonin
  - Prostaglandins
  - Corticotropin releasing factors
  - Adrenocoticotropic hormone (ACTH) – causing Cushing's syndrome.
  - Histaminases, somatostatin and carcinoembryonic antigen (CEA).

NB: Calcitonin and CEA post-op follow up

MTC cont.

- The aggressiveness of MTC varies.
- In familial Medullary carcinoma the tumor tend to be **indolent**, with a 10 years survival of about 90%.
- MTC associated with MEN IIb and sporadic types are **aggressive** (10 year survival appr. 30 – 50%.)
- Death is usually the consequence of lymphatic and hematogenous dissemination commonly to regional nodes, lungs ,liver and bone.

- **Pathology**. MTCs typically are unilateral (80%) in patients with sporadic disease and multicentric in familial cases, with bilateral tumors occurring in up to 90% of familial patients.
- Microscopically, tumors are composed of sheets of infiltrating neoplastic cells separated by collagen and amyloid.
- Marked heterogeneity is present; cells may be polygonal or spindle shaped.
- The presence of amyloid is a diagnostic finding

Anaplastic Thyroid Carcinomas

- Is a **rare but very aggressive** (approx. 5% of all thyroid carcinomas).
- Tend to occur in elderly individuals seventh and eighth decade of life particularly in endemic goitrous regions.
- Arise in a **long-standing benign** lesion or in differentiated carcinoma (female :male = 3.5:1).
- Metastasize to lymph node both locally and widely(Pulmonary mets. are common but not to bone)
-

❖ Multimodalities treatment is the best option

- The typical patient has a long-standing neck mass, which rapidly enlarges and may be painful.
- Associated symptoms such as dysphonia, dysphagia, and dyspnea are common.
- The tumor is large and may be fixed to surrounding structures or may be ulcerated with areas of necrosis
- Lymph nodes usually are palpable at presentation.
- Evidence of metastatic spread also may be present. Diagnosis is confirmed by FNAB revealing characteristic giant and multinucleated cells. Differential diagnoses on FNA can include lymphomas, medullary carcinomas, direct extension from a laryngeal carcinoma, or other metastatic carcinomas or melanoma

- Pathology:The three main histologic growth patterns are spindle cell, squamoid, and pleomorphic giant cell.
- Tumors may show a predominance of one pattern or a mixture of various patterns.
- Foci of more differentiated thyroid tumors, either follicular or papillary, may be seen, suggesting that anaplastic tumors arise from more well-differentiated tumors

Lymphoma of the Thyroid Gland

- Primary thyroid lymphoma is a rare disease.
- Most thyroid lymphomas are non-Hodgkin's of B-cell origin .
- There is a strong association between Hashimoto's Thyroiditis and lymphoma of the thyroid gland.
- The majority of these patients present with a **neck mass but usually they are euthyroid**.

Lymphoma cont..

- FNAC usually **distinguishes** between lymphoma and anaplastic carcinoma.
- Sometimes it is very difficult, however, to differentiate lymphoma from Hashimoto's thyroiditis.
- Immunohistochemical staining and flow cytometry, can help in the diagnosis of the lymphoma.
- After the diagnosis is established all patients should be staged.
- These tumors are **chemosensitive** and **radiosensitive** and because they usually extend outside the thyroid gland, surgical resection alone is rarely curative.
- Thus radiotherapy chemotherapy is the prefered therapy. Different protocols have been used

DIAGNOSTIC STRATEGIES

Clinical presentations.

Pts with thyroid tumour may present with:

- ❖Rapidly enlarging thyroid (i.e goitre)
- ❖Pain in the neck
- ❖Symptoms of hyperthyroidism (in Toxic Goitre)
- ❖Stridor due to tracheal compression
- ❖Dysphagia due to oesophageal compression
- ❖Hoarseness of voice due to vocal cord palsy
- ❖Features of distant mets..

Clinical Presntn cont..

- A solitary nodule in a pt < 30yrs has 10-20% chance of malignancy and even higher in a very young or old pt.
- Of those found to be malignant, 80% may have cervical lymphadenopathy.

Physical examination

- In particular surgeons look for hardness
- Anterior neck swelling moves with swallowing, trying to get below the swelling in the midline..
- If prolongation, the pt neck is extended
- Note that cysts feels like a sac full of fluid
- Colloid feels doughy
- Differentiated ca and MTC feels like a hard rubber nodule.
- Anaplastic tumours feels hard fixed and craggy
- Lymphomas are frequently diffuse

Physical exam. cont..

- **Neck** and **axilla** are palpated carefully for **lymphnodes** .

- A solitary or multiple thyroid nodules as well as
  cervical lymphadenopathy can be detected

- Finally the pharynx and larynx can be examined by a direct fibre optic endoscopy to look for **vocal cords paralysis** or **invasion by tumour**.

Wayne's Clinical Diagnostic Index for hyperthroism

Signs	Present		Absent
Palpable thyroid	-	+3	-3
Exophthalmos	-	+2	
Lid retraction	-	+2	
Finger tremor	-	+1	
Bruit over thyroid	-	+2	-2
Atrial fibrillation	-	+4	
Pulse: 90bpm	-	+3	
80bpm	-	-	-3

Wayne's Clinical diag. Index cont..

Symptoms	Present	Absent
Palpitation	+2	-
Excessive sweating	+3	-
Appetite Increased	+3	-
Appetite Decreased	-	-3
Weight Increased	-	-3
Weight Decreased	+3	-
Heat Intolerance	+5	-
Cold Intolerance	-	-5

Score >19=Toxic goitre; and <11, no Toxic goitre

Investigation - Thyroid function test

- **Serum T3 $T4** - Most useful index of thyroid function

1**. Total T4** - 55-150nmol/L – reflect output from Thyroid gland (99.9% bound to Protein)

- Level is elevated in in hyperthyroidism, and in states of hyperglobulinaemia (and vice versa).

2**. Total T3** - 1.5-3.5nmol/L – indicate peripheral metabolism of thyroid hormone (99.5% bound to protein), so not suitable for screening in a non-stimulated gland.

Thyroid Function Test cont..

3. **Free T3** - 3 -9pmol/L –useful in early hyperthyroidism
4. **Free T4** - 12 - 28pmol/L – Useful in confirming Dx of hyperthyroidism
5. **T3 resin uptake test** - ↑T4 leads to less binding sites for radio-labeled T3

Thyrotropin Releasing Hormone (TRH)- Evaluate Pituitary TSH release.

- 500ɲg of TRH i/v TSH measured at 30 and 60 min

6. **Uptake test**

- Asses the distribution and rate at which the thyroid traps the iodine
- Reflection of the rate of thyroid hormones secretion in the circulation
- Tracer dose (5microcuries) of **Iodine131** is administered PO,
- Scanning is performed within 10 -120 mints
- Uptake is high in hyperthyroidism
- **I** -132 and **Tc** -99m are also used (short ½ life)

Investigations cont..

7. **Serum TSH** (5 micro U).

- Level raised in hypothyroidism and almost undetectable in hyperthyroidism.
- It is the most sensitive test in hypothyroidism
- Reliability depending on the unimpaired function of the Hypothalamic –Pituitary axis.

Investigation cont..

8**. Thyroid Antibodies**

- Antithyroglobulin (Anti – Tg)
- Antimicrosomal or Antithyroid peroxidase (Anti-TPO)
- Thyroid Stimulating Immunoglobulin (TSI)

- Anti-Tg and Anti-TPO do not determine thyroid function but rather the underlying disorder (e.g autoimmune thyroiditis)

9**. Serum Thyroglobulin** – Levels increase in destructive processes as Thyroiditis or overactive states as Gd/TMNG

10. **Fine Needle Aspiration Cytology** (FNAC)

- *FNAC* - performed if nodules are clinically **suspicious malignacy**(e.g. solid, rapidly growing)-good in Dx of papillary but limited for follicular ca.
- It might also be helpful in the evaluation of suspicious lymph nodes.
- **Recently, a PCR-based method analyzing thyroid specific transcripts of the TSH-receptor and thyroglobulin has been shown to facilitate preoperative diagnosis of differentiated thyroid carcinoma in small lymph nodes**.

TABLE 37.3 The 2017 Bethesda system for reporting thyroid cytopathology implied risk of malignancy and recommended clinical management.

DIAGNOSTIC CATEGORY (BETHESDA NUMBER)	RISK OF MALIGNANCY IF NIFTP ≠ CANCER	RISK OF MALIGNANCY IF NIFTP = CANCER	USUAL MANAGEMENT
Nondiagnostic or unsatisfactory (I)	5%–10%	5%–10%	Repeat FNA with ultrasound guidance
Benign (II)	0%–3%	0%–3%	Clinical and sonographic follow-up
AUS/FLUS (III)	6%–18%	~10%–30%	Repeat FNA, molecular testing, or lobectomy
FN/SFN (IV)	10%–40%	25%–40%	Molecular testing or lobectomy
Suspicious for malignancy (V)	45%–60%	50%–75%	Near-total thyroidectomy or lobectomy
Malignant (VI)	94%–96%	97%–99%	Near-total thyroidectomy or lobectomy

From Cibas ES, Ali SZ. The 2017 Bethesda system for reporting thyroid cytopathology. *Thyroid*. 2017; 27:1341–1346.

AUS/FLUS, Atypia of undetermined significance or follicular lesion of undetermined significance; *FN/SFN*, follicular neoplasm or suspicious for follicular neoplasm; *FNA*, fine-needle aspiration; *NIFTP*, noninvasive follicular thyroid neoplasm with papillary-like nuclear features.

11. **Imaging - Ultrasound**..

- Ultrasound scanning- helpful in evaluating thyroid nodule: - Size
  - Solid vs. Cystic
  - Multicentricity
  - Asses Lymphadenopathy
  - Guide FNAC
- CT / MRI SCAN – excellent for imaging thyroid gland and adjacent nodes.

TIRAD

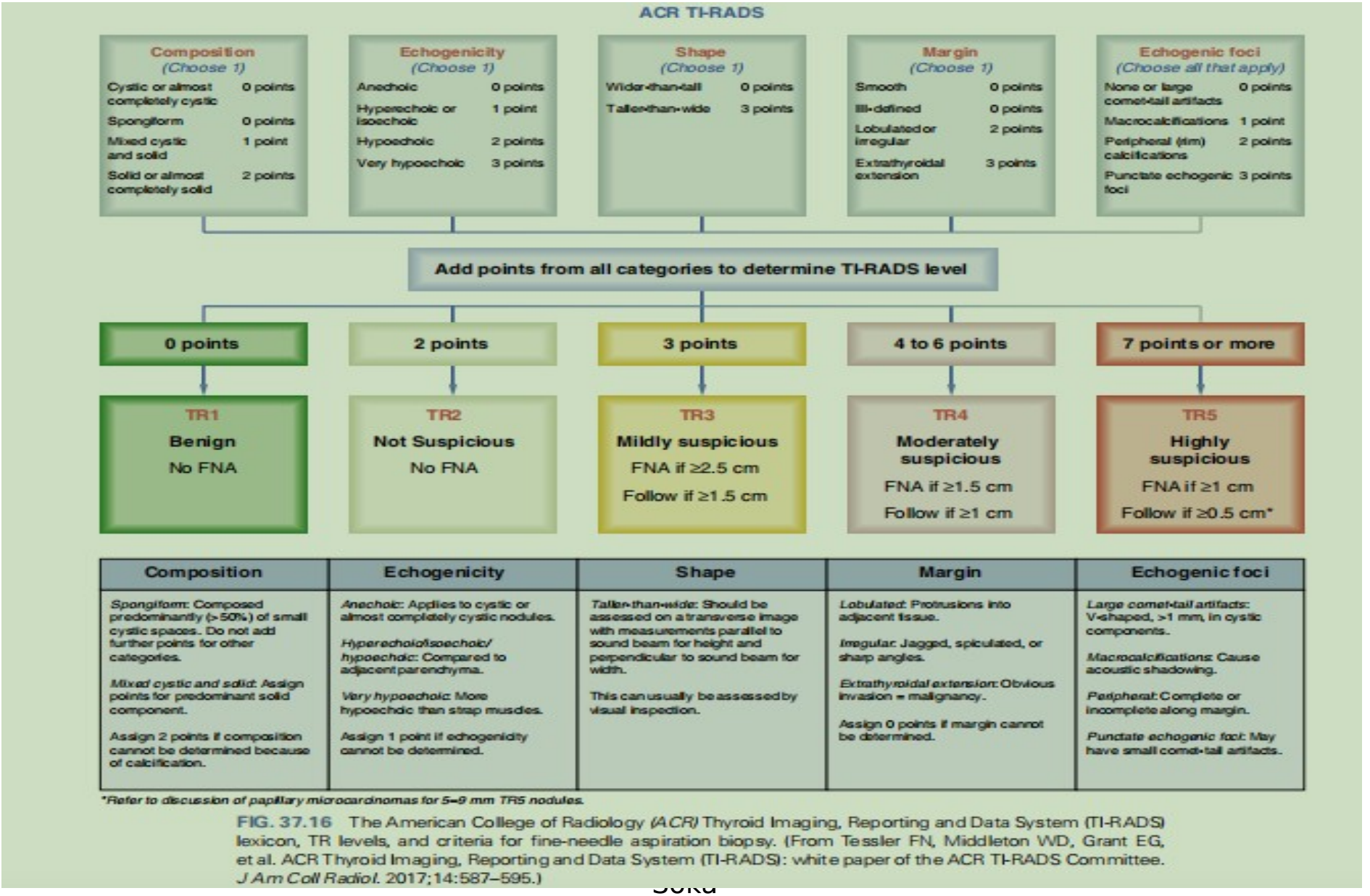
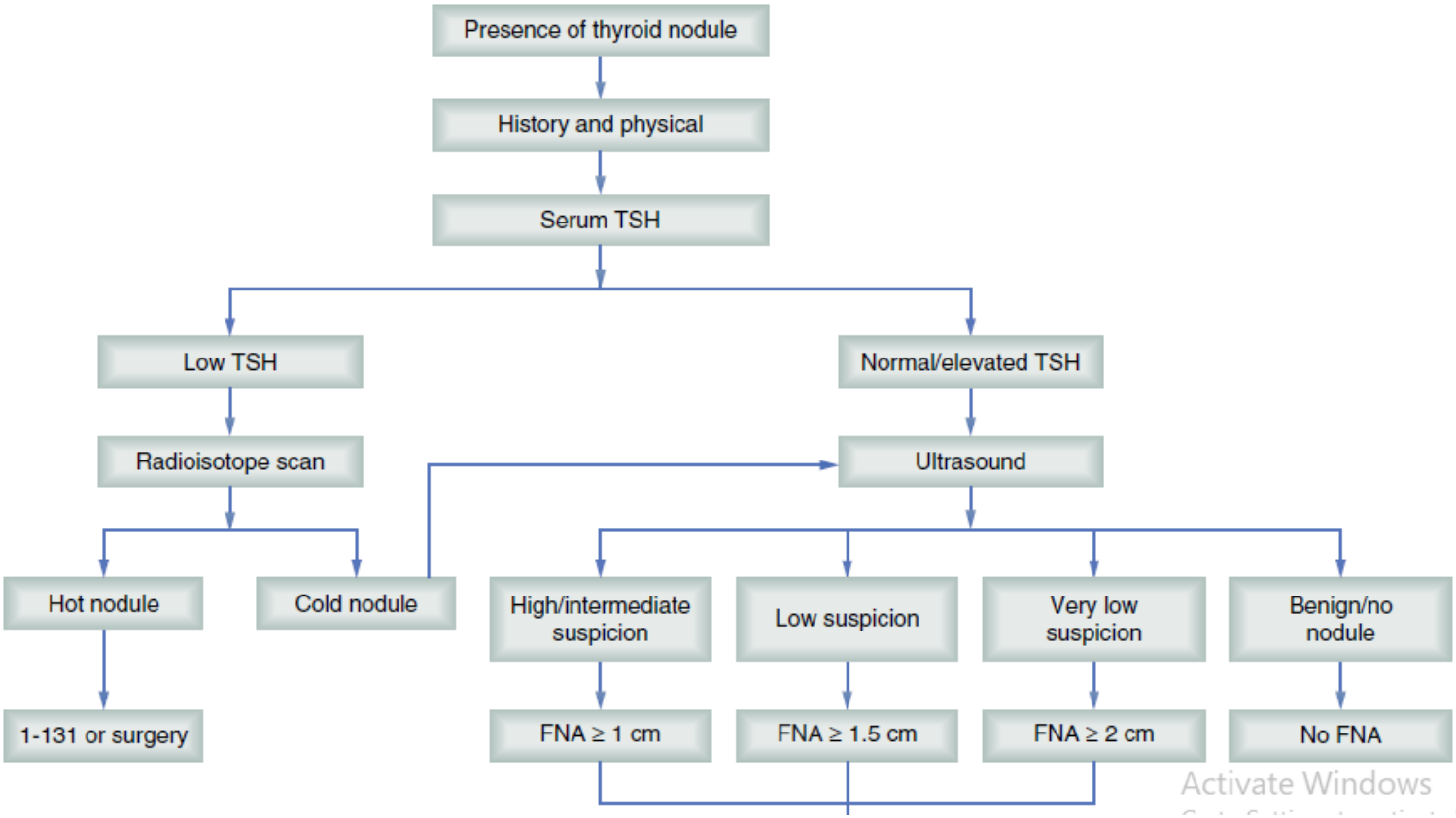
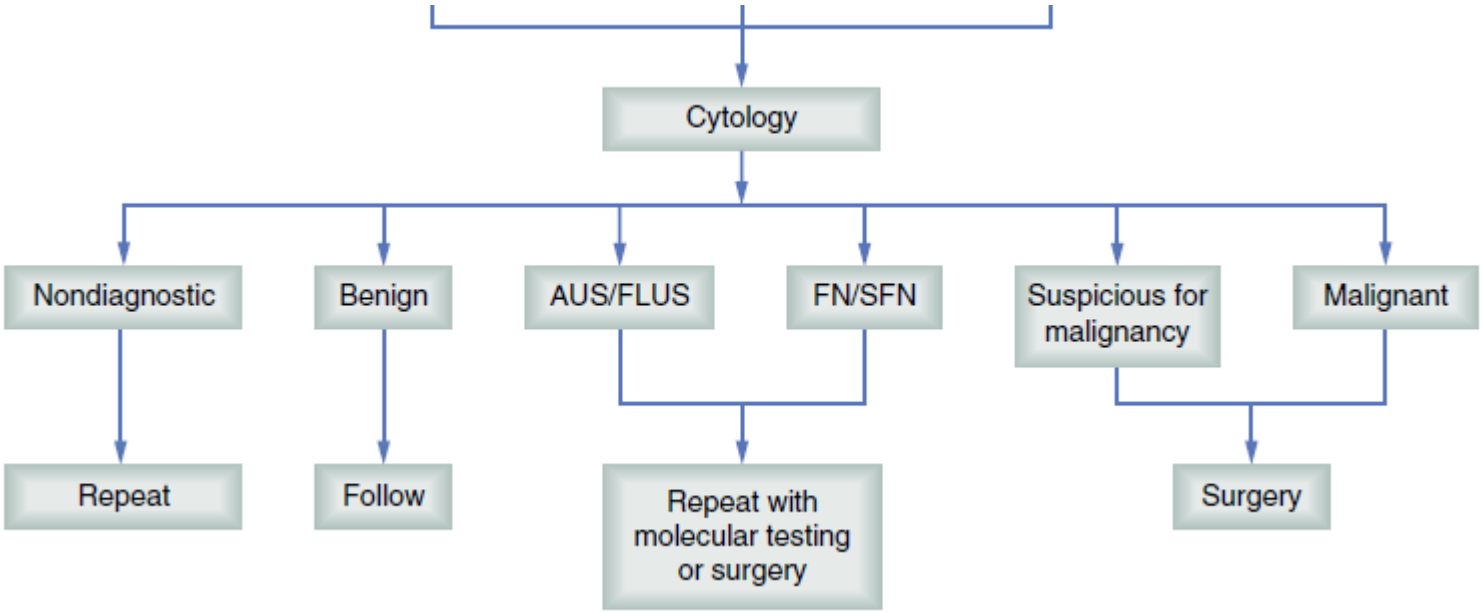

ACR TI-RADS
Composition
(Choose 1)
Cystic or almost completely cystic 0 points
Spongiform 0 points
Mixed cystic and solid 1 point
Solid or almost completely solid 2 points
Echogenicity
(Choose 1)
Anechoic 0 points
Hyperechoic or isoechoic 1 point
Hypoechoic 2 points
Very hypoechoic 3 points
Shape
(Choose 1)
Wider-than-tall 0 points
Taller-than-wide 3 points
Margin
(Choose 1)
Smooth 0 points
Ill-defined 0 points
Lobulated or irregular 2 points
Extrathyroidal extension 3 points
Echogenic foci
(Choose all that apply)
None or large comet-tail artifacts 0 points
Macrocalcifications 1 point
Peripheral (rim) calcifications 2 points
Punctate echogenic foci 3 points
Add points from all categories to determine TI-RADS level
0 points
2 points
3 points
4 to 6 points
7 points or more
TR1
Benign
No FNA
TR2
Not Suspicious
No FNA
TR3
Mildly suspicious
FNA if ≥2.5 cm
Follow if ≥1.5 cm
TR4
Moderately suspicious
FNA if ≥1.5 cm
Follow if ≥1 cm
TR5
Highly suspicious
FNA if ≥1 cm
Follow if ≥0.5 cm*
Composition
Spongiform: Composed predominantly (>50%) of small cystic spaces. Do not add further points for other categories.
Mixed cystic and solid: Assign points for predominant solid component.
Assign 2 points if composition cannot be determined because of calcification.
Echogenicity
Anechoic: Applies to cystic or almost completely cystic nodules.
Hyperechoic/isoechoic/hypoechoic: Compared to adjacent parenchyma.
Very hypoechoic: More hypoechoic than strap muscles.
Assign 1 point if echogenicity cannot be determined.
Shape
Taller-than-wide: Should be assessed on a transverse image with measurements parallel to sound beam for height and perpendicular to sound beam for width.
This can usually be assessed by visual inspection.
Margin
Lobulated: Protrusions into adjacent tissue.
Irregular: Jagged, spiculated, or sharp angles.
Extrathyroidal extension: Obvious invasion = malignancy.
Assign 0 points if margin cannot be determined.
Echogenic foci
Large comet-tail artifacts: V-shaped, >1 mm, in cystic components.
Macrocalcifications: Cause acoustic shadowing.
Peripheral: Complete or incomplete along margin.
Punctate echogenic foci: May have small comet-tail artifacts.
*Refer to discussion of papillary microcarcinomas for 5–9 mm TR5 nodules.

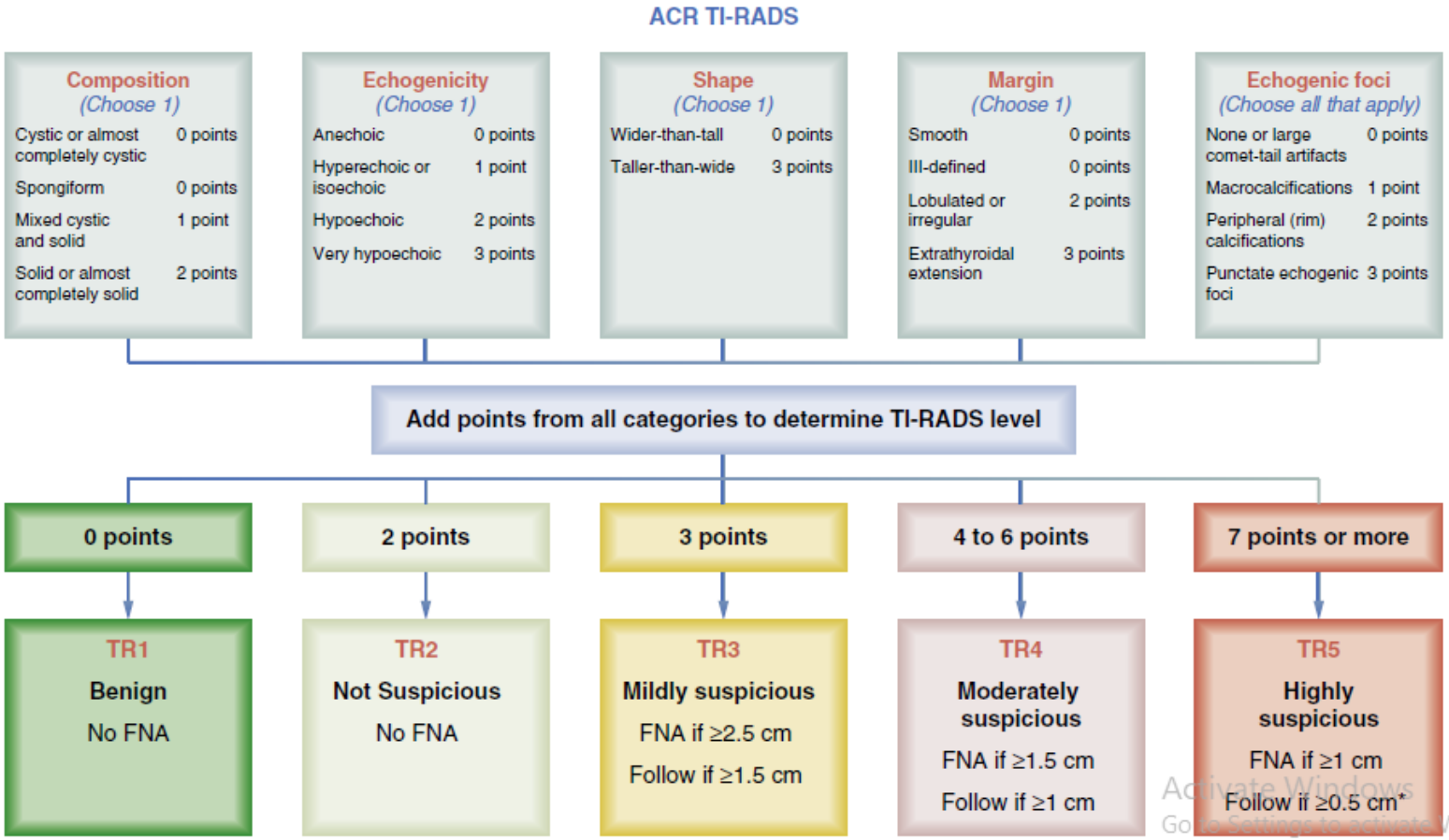
FIG. 37.16 The American College of Radiology *(ACR)* Thyroid Imaging, Reporting and Data System (TI-RADS) lexicon, TR levels, and criteria for fine-needle aspiration biopsy. (From Tessler FN, Middleton WD, Grant EG, et al. ACR Thyroid Imaging, Reporting and Data System (TI-RADS): white paper of the ACR TI-RADS Committee. *J Am Coll Radiol.* 2017;14:587–595.)

Diagnostic approach in Thyroid malignancy



Activate Windows


Cytology
Nondiagnostic
Benign
AUS/FLUS
FN/SFN
Suspicious for malignancy
Malignant
Repeat
Follow
Repeat with molecular testing or surgery
Surgery



Activate Windows
Go to Settings to activate Windows

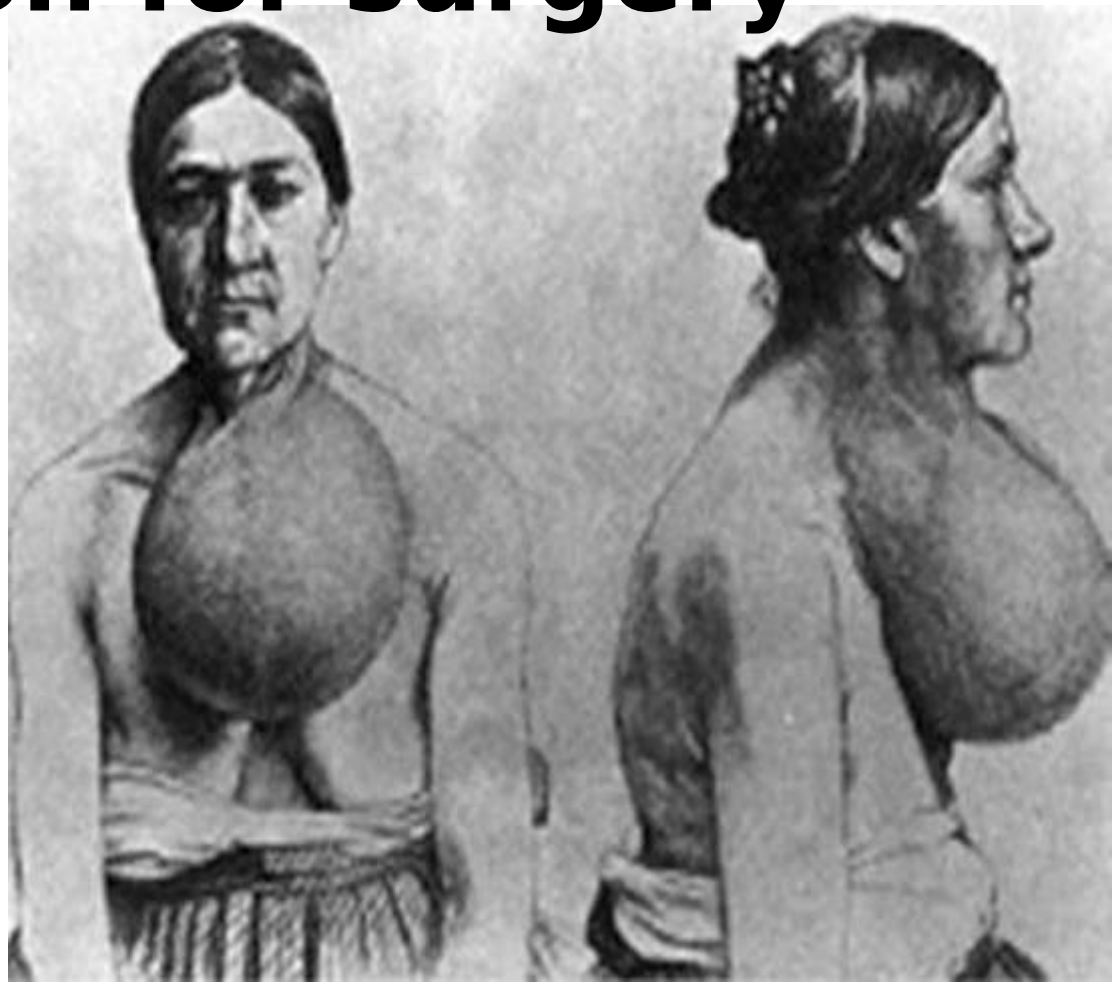
Composition	Echogenicity	Shape	Margin	Echogenic foci
Spongiform: Composed predominantly (>50%) of small cystic spaces. Do not add further points for other categories. *Mixed cystic and solid*: Assign points for predominant solid component. Assign 2 points if composition cannot be determined because of calcification.	*Anechoic*: Applies to cystic or almost completely cystic nodules. *Hyperechoic/isoechoic/ hypoechoic*: Compared to adjacent parenchyma. *Very hypoechoic*: More hypoechoic than strap muscles. Assign 1 point if echogenicity cannot be determined.	*Taller-than-wide*: Should be assessed on a transverse image with measurements parallel to sound beam for height and perpendicular to sound beam for width. This can usually be assessed by visual inspection.	*Lobulated*: Protrusions into adjacent tissue. *Irregular*: Jagged, spiculated, or sharp angles. *Extrathyroidal extension*: Obvious invasion = malignancy. Assign 0 points if margin cannot be determined.	*Large comet-tail artifacts*: V-shaped, >1 mm, in cystic components. *Macrocalcifications*: Cause acoustic shadowing. *Peripheral*: Complete or incomplete along margin. *Punctate echogenic foci*: May have small comet-tail artifacts.

**Refer to discussion of papillary microcarcinomas for 5–9 mm TR5 nodules.*

Treatment modalities for Thyroid diseases

- Medical treatment
- **Surgery**
- Radioactive iodine(PTC,FTC,Hurthle Cell)
- External beam radiotherapy(MTC with Distant Mets)
- Thyroxine therapy(Post Surgery)
- Chemotherapy(Lyphoma+Anaplastic)

Indication for surgery



Disfiguring neck mass

Disfiguring neck mass

Soka

Treatment modalities for Thyroid diseases

- Medical treatment
- **Surgery**
- Radioactive iodine
- External beam radiotherapy
- Thyroxine therapy
- Chemotherapy

INDICATIONS CONT..

1. Cosmetic reasons
2. Pressure symptoms – Trachea

- Oesophagus

- Neck veins

NB: Pressure symptoms more with retrosternal goitre

- In pre-pubertal goitre, resolves spontaneously.

e.g In Simple diffuse Goitre

INDICATIONS CONT..

3. Frequently become **toxic** with time (2ndry toxic)
4. Liable to undergo **malignant transformation** with a risk of 5%.

NB: In women in the goitrogenic areas, operation is reserved for: - Hard nodules

- Fixation
- Recent increase in size

e.g Simple Nodular Goiter

INDICATIONS CONT..

5. Isolated thyroid **nodule in a man-** more likely to be malignant.

- Identified by USS, which report on
  - Size
  - Consistency-e.g cystic etc.

-FNAC and scanning (i.e radioactive Iodine uptake) is recommended

Can be- Hot (seldomly malignant), warm or cold (usually malignant).

e.g Solitary T. Nodule

INDICATION CONT..

6. Lack of response to antithyroid drugs
7. Toxic effects of drugs
8. Relapse after apparent cure

- Treatment may be by anti-thyroids, surgery, or radioactive Iodine I-131, separately or combination.

NB:Most patients respond well to anti-thyroids.

e.g Toxic Diffuse Goitre

Surgical options

- **Total Thyroidectomy** = 2 x total lobectomy + Isthmusectomy
- **Near Total Thyroidectomy** = total lobectomy + Isthmusectomy + subtotal lobectomy
- **Sub Total Thryoidectomy** = 2 x subtotal lobectomy + Isthmusectomy
- **Lobectomy** = Total lobectomy + Isthmusectomy

POST OP CARE

- Postoperatively, the patient is nursed with the head and shoulders elevated for 6 to 12 hours to maintain negative pressure in the veins.
- The serum calcium level is measured approx. 5 to 8 hours post op. in patients who have undergone bilateral procedures;
- No tests are required in those who have undergone unilateral procedures
- They usually resumes eating within 3 to 4 hours, and an antiemetic is ordered as needed (many patients experience postoperative nausea and emesis).

POST OP CARE CONT..

- On the first morning post op, **the serum calcium** and **phosphate** levels are measured.
- Can be repeated day 2 post op (If the Pt is still hospitalised)
- If the serum calcium is below 7.5 mg/dl or the patient experiences perioral **numbness** or **tingling**, oral calcium supplements should be given.
- A low serum phosphate level (< 2.5 mg/dl) usually is a sign of so-called bone hunger and suggests that there is little reason to be concerned about permanent hypoparathyroidism,
- When a high serum phosphate level (> 4.5 mg/dl) is detected, should be concerned about permanent hypoparathyroidism

COMPLICATIONS OF THYROIDECTOMY

A:Metabolic

1. *Hypoparathyroidism(*biochemical & Signs)

- ✓ Temporary Hypoparathyroidism
- ✓ Temporary hypocalcemia without hypoparathyroidism(‘hungry bone’ syndrome)
- ✓ Permanent hypoparathyroidism (ischemia and removal of the gland)
- ✓ Spurious hypoparathyroidism(spurious hypocalcemia) (total calcium is decreased but ionized calcium is normal)

2. *Thyroid storm (thyrotoxic crisis)*

3. *Hypothyroidism* (20 – 40%)

4. Hypercalcaemia

COMPLICATIONS

B. *Non metabolic*

1. *Neural:*

- ✓ ***RLN injuries***
- ✓ External laryngeal nerve injuries

2. *Nonneural:*

- ✓ Hemorrhage
- ✓ Hematoma
- ✓ Stridor and airway obstruction
- ✓ Skin flap necrosis
- ✓ keloids
- ✓ Compromise of tracheoesophageal blood supply
- ✓ Horner's syndrome (sympathetic nerve injury)
- ✓ Chylous fistula (extremely rare).

NB: Risk greater with larger goitres, total thyroidectomy and re-operation

Thyrotoxic crisis (Thyroid storm)

- It is a sudden life-threatening exacerbation of thyrotoxicosis seen in 1 to 2% of patients.
- This is a syndrome manifested by high grade fever, sweating, tachypnea, hyperventilation, tachycardia, palpitation, restlessness, tremor, psychosis, delirium, diarrhea, dehydration, nausea,vomiting, hypotension and end-stage coma.

Thyroid storm causes

a) Inadequate preparation prior to surgery
b) Infection in thyrotoxicosis
c) Trauma in thyrotoxicosis
d) Pre-eclampsia
e) Diabetic ketoacidosis
f) Surgical emergency
g) Emotional stress
h) Vigorous palpation of the gland

Bayley's symptom complex of thyroid storm!?

Treatment of thyroid storm

1.To control fever:

- Acetaminophen is used
- Aspirin is never used as it can elevate the free thyroid hormones
- Tepid sponging
- Cooling blankets

2. *To correct dehydration and electrolyte imbalance:*

- IV fluids

3. *To control the heart rate:*

a. Propranalol 1–2 mg IV 6th hourly (40–80 mg QID) orally)

b. Esmolol 250 – 500 microgram per Kg body weight loading and 50microgram/Kg/minute maintenance

4. *To inhibit hormone release:*

a. Logols' iodine 10 drops 3 times

b. Sodium iodide 1gm IV over 24 hours

c. Super saturated potassium iodide (SSKI) 10 drops twice daily

5. *To inhibit new hormone synthesis:*

a. Propylthiouracil (50–200 mg)

b. Carbimazole (20 mg every 4 hours

PROGNOSTIC INDICATORS for THYROID Ca

- Hay and Associates- AGES
- Cady proposed AMES
- DeGroot and Associates
- TNM classification
- Molecular and Genetic Markers
  - Tumor DNA aneuploidy
  - ↓cAMP response to TSH
  - ↑epidermal growth factor binding
  - N-ras and gsp mutations
  - over-expression of c-myc
  - presence of p-53 mutations

Prognostics cont.

Hay and Associates-

A - Age, young <45 yrs Vs old >45 yrs

G – Histological **grade,** well Vs poorly differentiated tumors

E – Extra thyroidal invasion or metastasis

S – Tumor **size** < or > 1.5cm

MACIS scale

- Sophisticated post-operative modification of AGES
- Incorporate completeness of original surgery

Prognostics cont.

Cady's proposal

A- Age (for men < 40 and < 50 for women)

M- Metastasis

E- Extrathyroidal spread

S- Tumor size < or > 5cm

DeGroot and Associates

- **Stage I** - Intra-thyroid mass.
- **Stage II** - Cervical nodal metastasis
- **Stage III** - Extra- thyroidal invasion
- **Stage IV** - Distant metastasis

TNM classification

T- Primary tumour Tx- 1◦ tumour cannot be assessed To- No evidence of 1° tumour T1- Tumour ≤1cm,ltd to thyroid T2-tumour >1cm but <4cm and ltd to the gland T3->4cm ltd to gland T4-T any size but extend beyond the gland	N-regional lymphnode Nx-RL cannot be assessed No-No regional nodes mets N1- regional nodes mets N1a-Mets in ipsilateral cervical nodes N1b-mets in bilateral,midline,contralateral cervical or mediastinal nodes M-distant mets Mx-Distant mets can’t be assesed Mo-No Distant mets M1-Distant metastasis

References

- Manipal manual of surgery,4th edit
- Schwartz 11th edit.
- Sabiston Text Book Of Surgery, 20th Edition
- Bailey & Love's Short Practice of Surgery 27th Edition
- ACS Principles of Surgery, 6th Edition
- 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer